ALFRED CROWQUILL'S
PICTORIAL
ARITHMETIC.

West

Mr. Cocker and his Family.

THE TUTOR'S ASSISTANT, OR

COMIC FIGURES

OF

ARITHMETIC;

SLIGHTLY ALTERED AND ELUCIDATED FROM

Walking-game,

BY

ALFRED CROWQUILL.

LONDON:

J. AND F. HARWOOD, 26, FENCHURCH STREET.
WHITTAKER AND CO., AVE-MARIA LANE.
MDCCCXLIII.

ADVERTISEMENT.

In **Addition** to the numerous talented publications
that have of late been prepared for the instruction or

THE LAST ADDITION.

amusement of young persons, and of which the rapid
Multiplication has created among the intelligent and
discerning a **Division** of admiration and patronage,

LIKE THE DONKEY BETWEEN TWO BUNDLES OF HAY.

the present 'Comic Arithmetic' is offered for the edification of the public, both great and small; and it is hoped, that the trifling 𝕾𝖚𝖇𝖙𝖗𝖆𝖈𝖙𝖎𝖔𝖓 𝖔𝖋 𝕸𝖔𝖓𝖊𝖞 taken in 𝕰𝖝𝖈𝖍𝖆𝖓𝖌𝖊 will be found, upon examination, to be laid out at 𝕮𝖔𝖒𝖕𝖔𝖚𝖓𝖉 𝕴𝖓𝖙𝖊𝖗𝖊𝖘𝖙.

The Author, albeit a man of no PRINCIPAL, is yet HONEST withal, and would not permit the 𝕻𝖗𝖆𝖈𝖙𝖎𝖈𝖊 of

A BAD PRACTICE.

any guile or deception whereby his works hereafter may vend only at a **Discount,** and his purse prove that he had been working a sum in **Reduction** in lieu of sterling **Multiplication of Money.**

That the novel *figures* he has introduced will enable the student more readily to turn the TABLES to *account,* accelerate his *progression,* and spare the tutor (and himself) the pain of " measuring by the rod," is the SUM total of the Artist's hopes.

A. C.
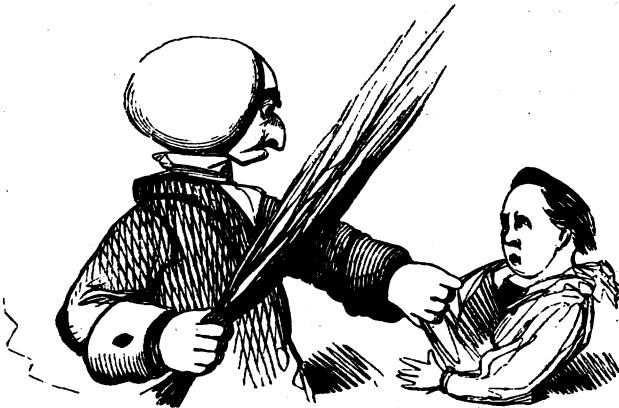
MEASURING BY THE ROD.

ARITHMETICAL TABLES.

NUMERATION.

Millions.
X. Millions.
C. Millions.
Thousands.
X. Thousands.
C. Thousands.
Hundreds.
Tens.
Units.

```
              : 1
            1 2
          1 2 3
      : 1   2 3 4
        1 2   3 4 5
      1 2 3   4 5 6
  : 1   2 3 4   5 6 7
  1 2   3 4 5   6 7 8
1 2 3   4 5 6   7 8 9
```

MULTIPLICATION.

1	2	3	4	5	6	7	8	9	10	11	12
12	24	36	48	60	72	84	96	108	120	132	144
11	22	33	44	55	66	77	88	99	110	121	132
10	20	30	40	50	60	70	80	90	100	110	120
9	18	27	36	45	54	63	72	81	90	99	108
8	16	24	32	40	48	56	64	72	80	88	96
7	14	21	28	35	42	49	56	63	70	77	84
6	12	18	24	30	36	42	48	54	60	66	72
5	10	15	20	25	30	35	40	45	50	55	60
4	8	12	16	20	24	28	32	36	40	44	48
3	6	9	12	15	18	21	24	27	30	33	36
2	4	6	8	10	12	14	16	18	20	22	24
1	2	3	4	5	6	7	8	9	10	11	12

MONEY.

Farthings.		Pence.		
qr.	d.	d.	s.	d.
1 is	$\frac14$	12 is	1	0
2......	$\frac12$	24 ..	2	0
3......	$\frac34$	36 ..	3	0
4......1		48 ..	4	0
6......$1\frac12$		60 ..	5	0
8......2		72 ..	6	0
10......$2\frac12$		84 ..	7	0
12......3		96 ..	8	0
14......$3\frac12$		108 ..	9	0
16......4		120 ..10	0	

PRACTICE TABLES.

Pence.			Shillings.		
d.	s.	d.	s.	£.	s
20 is	1	8	20 is	1	0
30 ..	2	6	30 ..	1	10
40 ..	3	4	40 ..	2	0
50 ..	4	2	50 ..	2	10
60 ..	5	0	60 ..	3	0
70 ..	5	10	70 ..	3	10
80 ..	6	8	80 ..	4	0
90 ..	7	6	90 ..	4	10
100 ..	8	4	100 ..	5	0
110 ..	9	2	110 ..	5	10
120 ..10	0		120 ..	6	0
130 ..10	10		130 ..	6	10
140 ..11	8		160 ..	8	0
144 ..12	0		200 ..10	0	

Of a Pound.

s.	d.	
10	0 is	$\frac12$
6	8 ..	$\frac13$
5	0 ..	$\frac14$
4	0 ..	$\frac15$
3	4 ..	$\frac16$
2	6 ..	$\frac18$
2	0 ..	$\frac{1}{10}$
1	8 ..	$\frac{1}{12}$
1	0 ..	$\frac{1}{20}$
0	10 ..	$\frac{1}{24}$
0	8 ..	$\frac{1}{30}$
0	7½ ..	$\frac{1}{32}$
0	6 ..	$\frac{1}{40}$
0	3 ..	$\frac{1}{80}$

Of a Shilling.

6d...is ..		$\frac12$
4		$\frac13$
3		$\frac14$
2		$\frac16$
1½		$\frac18$
1		$\frac{1}{12}$
¾		$\frac{1}{16}$

Of a Ton.

10 cwt. is		$\frac12$
5		$\frac14$
4		$\frac15$
2½		$\frac18$
2		$\frac{1}{10}$

Of a Cwt.

qr.	lb.	
2 or 56 is		$\frac12$
1 .... 28 ..		$\frac14$
0 .... 16 ..		$\frac17$
0 .... 14 ..		$\frac18$
0 .... 8 ..		$\frac{1}{14}$
0 .... 7 ..		$\frac{1}{16}$

Of a Quarter.

lb.	
14	$\frac12$
7	$\frac14$
4	$\frac17$
3½	$\frac18$

TABLES OF WEIGHTS AND MEASURES.

TROY WEIGHT.
24 Grains make 1 Pennyweight.
20 Pennyweights 1 Ounce.
12 Ounces . . 1 Pound.

AVOIRDUPOIS WEIGHT.
16 Drams make 1 Ounce.
16 Ounces . . 1 Pound.
28 Pounds . . 1 Quarter.
4 Quarters. . 1 Hundred wt.
20 Hundred wt. 1 Ton.

APOTHECARIES' WEIGHT.
20 Grains make 1 Scruple.
3 Scruples . . 1 Drachm.
8 Drachms . . 1 Ounce.
12 Ounces . . 1 Pound.

WOOL WEIGHT.
7 Pounds make 1 Clove.
2 Cloves . . 1 Stone.
2 Stones . . . 1 Tod.
$6\frac{1}{4}$ Tods . . . 1 Wey.
2 Weys . . . 1 Sack.
12 Sacks . . . 1 Last.

WINE MEASURE.
4 Quarts make 1 Gallon.
18 Gallons . . 1 Runlet.
42 Gallons . . 1 Tierce.
63 Gallons . . 1 Hogshead.
84 Gallons . . 1 Puncheon.
126 Gallons . . 1 Pipe.
252 Gallons . . 1 Tun.

ALE AND BEER MEASURE.
4 Quarts make 1 Gallon.
9 Gallons . . 1 Firkin.
2 Firkins . . 1 Kilderkin.
2 Kilderkins . 1 Barrel.
$1\frac{1}{2}$ Barrel . . 1 Hogshead.
2 Barrels . . 1 Puncheon.
3 Barrels . . 1 Butt.

COALS.
3 Bushels make 1 Sack.
36 Bushels . . 1 Chaldron.

HAY.
36 Pounds . 1 Truss of Straw.
56 Pounds . 1 Truss old Hay.
60 Pounds . 1 Truss new Hay.
36 Trusses . 1 Load.

LONG MEASURE.
12 Inches make 1 Foot.
3 Feet . . . . 1 Yard.
$5\frac{1}{2}$ Yards . . . 1 Pole.
40 Poles . . . 1 Furlong.
8 Furlongs . . 1 Mile.

LAND MEASURE.
9 Feet make 1 Yard.
$30\frac{1}{4}$ Yards . . . 1 Pole.
40 Poles . . . 1 Rood.
4 Roods . . . 1 Acre.

CLOTH MEASURE.
$2\frac{1}{4}$ Inches make 1 Nail.
4 Nails . . . 1 Quarter.
3 Quarters . . 1 Flemish Ell.
4 Quarters . . 1 Yard.
5 Quarters . . 1 English Ell.
6 Quarters . . 1 French Ell.

TIME.
60 Seconds make 1 Minute.
60 Minutes . . 1 Hour.
24 Hours . . . 1 Day.
7 Days . . . 1 Week.
4 Weeks . . 1 Month.
365 Days, 6 Hours 1 Year.

DRY MEASURE.
2 Quarts make 1 Pottle.
2 Pottles . . . 1 Gallon.
2 Gallons . . . 1 Peck.
4 Pecks . . . 1 Bushel.
2 Bushels . . . 1 Strike.
8 Bushels . . 1 Quarter.
5 Quarters . . 1 Wey.
2 Weys . . . 1 Last.

SOLID MEASURE.
1728 Inches . 1 Solid Foot.
27 Feet . 1 Yard or Load.

DEFINITIONS.

Arithmetic—is the art or science of computing by numbers; viz. an *Art*, because it determines the method of solving questions; a *Science*, as it estimates the nature and quality of numbers.

A *Whole Number* or *Integer*—consists of an exact number of units, as 1, 5, &c.

A *Fractional Number*—whether vulgar or decimal, is part of an unit, as ½, ¼, &c.

A *Mixed Number*—is a whole number and a fraction joined to it, as 4½, 5¾, &c.

A *Prime Number*—is that which cannot be divided by any other number, except a 1, without leaving a remainder

A *Square Number*—is the product of a number multiplied once by itself, as 16 is 4 times 4.

A *Cube Number*—is the product of a number multiplied twice by itself, as 3 times 3 is 9, and 3 times 9 is 27.

A *Composite Number*—is the product of any two whole numbers, as 20 is produced by multiplying 4 by 5.

Component Parts—are those of which any number consists, as 4½ is composed or consists of the whole number 4, and the fraction ½; these are its component parts.

Aliquot Parts—are such as are contained an exact number of times in a unit, as $\frac{1}{2}$ is contained exactly twice in one.

Digits, Units, or *Figures*—are the marks by which numbers are expressed; they are 1 one, 2 two, 3 three, 4 four, 5 five, 6 six, 7 seven, 8 eight, 9 nine, and 0 cipher or *nought.*
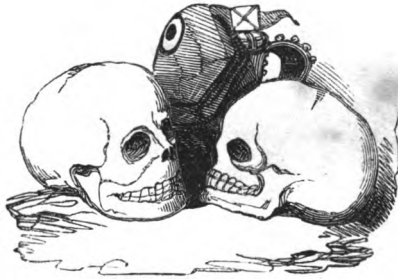
NOTE.—All operations in Arithmetic consist of increasing or diminishing, and are performed by the first four rules, viz. Addition and Multiplication for increasing ; Subtraction and Division for diminishing.

EXPLANATION

OF

THE CHARACTERS USED IN ARITHMETIC.

$=$ *Equal* The sign of Equality; as, 4 qrs. $=$ 1 cwt. signifies that 4 qrs. are equal to 1 cwt.

SIGNS OF EQUALITY.

— *Minus or less* The sign of Subtraction; as, 8 — 2
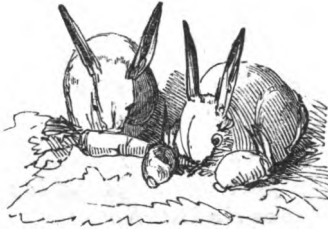   = 6; that is, 8 less 2 is equal to 6.
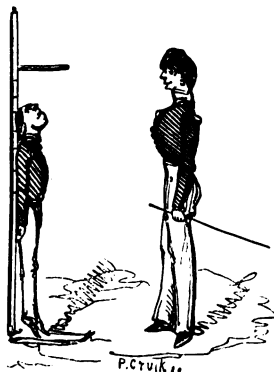
MINUS OR LESS.

+ *Plus or more* The sign of Addition; as, 4 + 4 = 8;
   that is, 4 added to 4 is equal to 8.

4 ADDED TO 4 IS EQUAL TO 8.

$\times$ *Multiplied by* The sign of Multiplication; as, $4 \times 6 = 24$; that is, 4 multiplied by 6 is equal to 24.

SIGNS OF MULTIPLICATION.

$\div$ *Divided by* The sign of Division; as, $8 \div 2 = 4$; that is, 8 divided by 2 is equal to 4.

SIGNS OF DIVISION.

$\dfrac{2357}{63}$ Numbers placed like a fraction likewise denote division; the upper number being the dividend, and the lower the divisor.

: *is to* :: *so is* : *to* }	The signs of Proportion; as 2 : 4 :: 8 : 16; that is, as 2 is to 4, so is 8 to 16.

$7-2+5=10$ Shows that the difference between 7 and 2 added to 5, is equal to 10.

$\overline{9-2+5}=2$ Signifies that the sum of 2 and 5 taken from 9, is equal to 2.

A line over any number of figures implies, that they must be taken together, or the last character would read thus, 9 minus 2 = 7 plus 5 equal to 12.

$\sqrt{}$ Prefixed to any number, signifies the Square Root of that number.

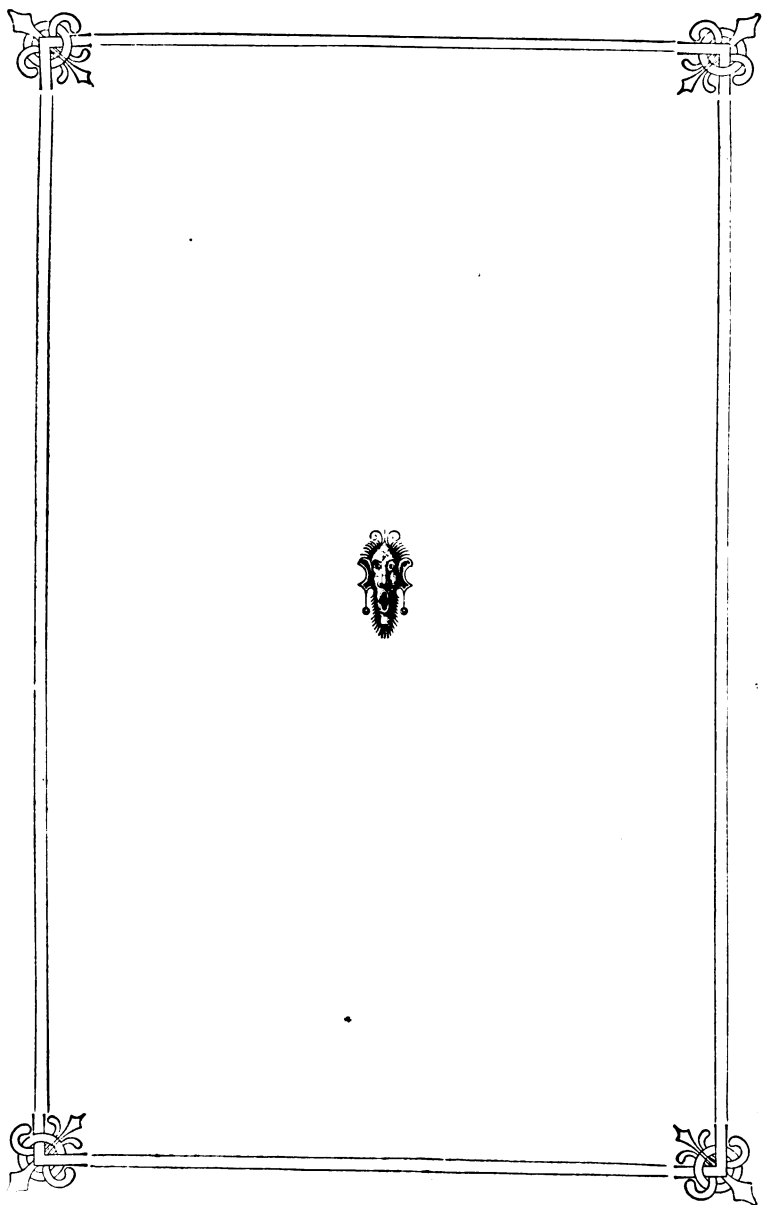$\sqrt[3]{}$ Signifies the Cube Root of that number.

$\sqrt[4]{}$ Denotes the Biquadrate, or fourth root of that number; that is, the Square Root of the Square Root.

id est, or *i. e.* That is.

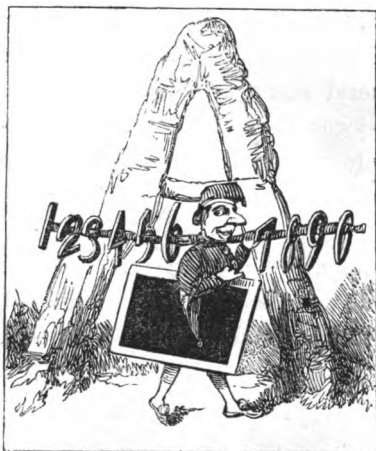Note.—Plus, minus, and id est, are Latin for *more*, *less*, and *that is*.

ARITHMETIC,

IN WHOLE NUMBERS.

THE INTRODUCTION.

RITHMETIC is the Art or Science of computing by numbers: it has five principal or fundamental Rules upon which all its operations depend, viz.

NOTATION or NUMERATION, ADDITION, SUBTRACTION, MULTIPLICATION, and DIVISION.

When it treats of whole numbers, it is called *Vulgar*, or *Common Arithmetic;* but when of broken numbers, or parts of numbers, it is called *Fractions*.

Unity, or an *Unit*, is that by which every thing is regarded as one, being the beginning of number; as one man, one horse, one child.

Number is either simply one, or a compound of several units; as one man, three men, ten men.

B

An *Integer*, or *Whole Number*, is some certain pre-
cise quantity of units; as two, five, ten. These are
so called as distinguished from *Fractions*, which are
broken numbers, or parts of numbers; as one-half,
two-thirds, or five-eighths.

The numbers in Arithmetic are expressed by the
following ten figures, or digits; viz. 1 one, 2 two,
3 three, 4 four, 5 five, 6 six, 7 seven, 8 eight, 9 nine,
0 cipher, or nothing. These characters were formerly
all called by the general name of *Ciphers*; whence
the art of Arithmetic was then often called Cipher-
ing. Besides this value of those figures, they have
also another or *local* value, which depends on the
place they occupy when joined together.

When a figure stands alone, it expresses a number
equal to its name; but when two or more are united,
they have a very different value according to their

PLACE OR POSITION.

Thus, 2 signifies two, but 20 signifies two tens or
twenty, 200 means two hundred, &c.

Notation and Numeration.

These rules teach how to denote or express any proposed number, either by words or characters: or, to read and write down any sum or number.

TABLE.

Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.
9	8	7 .	6	5	4 .	3	2	1

Here, any figure in the first place, reckoning from right to left, denotes only its own simple value; but that in the second place denotes ten times its simple value; and that in the third place a hundred times its simple value, and so on; the value of any figure, in each successive place, being always ten times its former value.

NOTATION is the setting down in figures any number proposed in words, which is done by setting down the figures instead of the words or names be-

NOTE.—There are other terms for reading a larger number of figures; viz. the seventh figure, as above, constitutes millions, six more would be billions, six more trillions, and so on for every six figures, to quadrillions, quintillions, sextillions, septillions, octillions, nonillions, decillions, &c.

longing to them, supplying the vacant places with ciphers where any words do not occur.

NUMERATION is the reading of any number in words that is proposed or set down in figures, which will be easily done by help of the following

RULE.

There are three periods; the first on the right hand is units; the second thousands; and the third millions; each consisting of three figures or places. Reckon the first figure of each from the left hand as so many hundreds, the next as tens, and the third as so many single ones of what is written over them. The numbers in the table above are read thus: Nine hundred and eighty-seven *millions,* six hundred and fifty-four *thousands,* three hundred and twenty-one.

P Cruik sc

THE APPLICATION.

Write in Figures the following Numbers:

Twenty-three.

Two hundred and fifty-four.

Three thousand, two hundred and four.

Twenty-five thousand, eight hundred and sixty-six.

One hundred and thirty-two thousand, two hundred and forty-five.

Four millions, nine hundred and forty-one thousand, and four hundred.

Twenty-seven millions, one hundred and fifty-seven thousand, eight hundred and thirty-two.

Seven hundred and twenty-two millions, two hundred and thirty-one thousand, five hundred and four.

Six hundred and two millions, two hundred and ten thousand, and five hundred.

Three hundred and thirty-three millions, six hundred.

Write in Words:

|			
85	5201	5900030	65700047
59	20760	5207054	900061057
172	519007	2071909	221900790
2017	754058	70054008	973586472
1293	40071	421723	147269800

NOTATION BY ROMAN FIGURES.

The Romans, like several other nations, expressed their numbers by certain letters of the alphabet. The Romans used only seven numeral letters, being the seven following capitals; viz. I for one; V for five; X for ten; L for fifty; C for a hundred; D for five hundred; M for a thousand. The other numbers they expressed by various repetitions and combinations of these, after the following manner:

I.	One	IX.	Nine
II.	Two	X.	Ten
III.	Three	XX.	Twenty
IV.	Four	XL.	Forty
V.	Five	L.	Fifty
VI.	Six	C.	One Hundred
VII.	Seven	D.	Five Hundred
VIII.	Eight	M.	One Thousand

Write in Words at length, and in Figures:

XVIII.	CCCVI.	LXXXVI.	MDCLXVIII.
XCI.	LXVIII.	DCCCVII.	CCCXCIX.
XLII.	DCI.	MCCXL.	MCCCXXXIX.
LVII.	CCXI.	MXXX.	MDCCCXLIII.

Simple Addition.
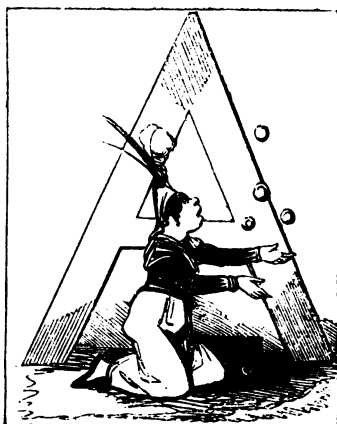
DDITION teacheth to find the amount or sum of two or more whole numbers. This is done as follows:—

Place the figures under each other, units under units, tens under tens, &c. and draw a line under them.

Add the first row or units together, and find how many tens are contained therein; then set down the figure remaining, under the row, and carry the tens to the next.

Repeat the same with each row, remembering to put down the whole amount of the last, and the sum is done.

31	147	928	4219	52681
27	216	104	7214	39764
62	438	726	3876	32618
46	724	318	1004	42074
89	176	428	27	52688

PROOF.

Cut off the top row, and work as before, omitting that line; the total of which, added to the top row, should produce the answer. Or, add each row downwards, on the same principal as upwards.

48	592	895	9289	72651
76	740	624	7268	59724
19	869	666	1497	38716
48	184	555	6218	92847
62	723	844	9248	18926
—	—	—	—	—
—	—	—	—	—

49	879	5392	87136	763915
38	352	7438	93723	825037
62	695	7135	27594	782916
40	876	8619	94603	650169
99	390	7390	69179	379634
61	264	2958	56526	672967
—	—	—	—	—

Hhds.	Casks.	Pipes.	Barrels.
62548	839572	3916494	6538542
89272	657361	5167821	9602461
97329	319594	8324753	7358576
51011	761676	8391627	6729548
88664	437840	7386553	1916927
65448	685781	6589221	6863954
54237	412796	300003	6208725
81426	100426	422224	1472664
71496	543617	732716	3107266
28476	287434	444283	3126914
43186	826104	582716	7210426
94725	527666	919284	8129143
54827	542915	307164	2132664
42104	409216	437216	6982164
21483	42715	4389	3261027
61926	4086	77407	8849176
32108	623	82	408297
32976	3590	642108	42632
82104	27884	70583	9266810
71534	320566	2691	50084
21668	526418	990079	3288107

Add 9358, 31, 195, 69129, 42684, and 108 together.
Add 129164, 721043, 421079, 48261, 530087, 55216, and 40817 together.

There is an army of 7 regiments, each of 974 soldiers and 16 officers :—how many men altogether?

There are three numbers; the first 215, the second 519, and the third as much as the other two;—what is the sum of them all? *Ans.* 1468.

There are two numbers; the least 40, their difference 14;—I desire to know the greater, and their sum?

Ans. 54 *greater number;* 94 *sum.*

A gentleman left his eldest daughter £1500 more than the youngest, and her fortune was 11 thousand, 11 hundred, and £11;—what was the eldest sister's fortune, and how much did the father leave them?

Ans. Eldest sister's fortune £13,611 ; *father left*
[*them* £25,722.
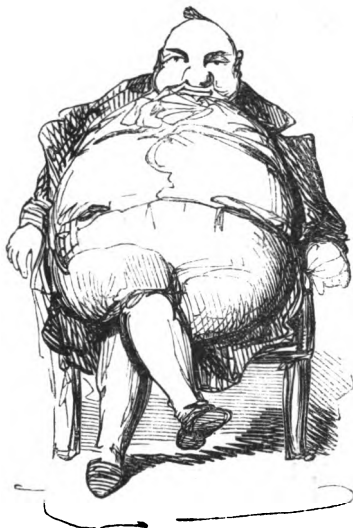
WHERE THERE IS MUCH ADDED.

Subtraction of Integers.

UBTRACTION teaches to find how much one number exceeds another, by taking the lesser sum from the greater, the amount left showing the remainder, or difference.— The method of doing this is as follows: Place the lesser number under the greater, in the same manner as in Addition, that is, units under units, tens under tens, and so on; and draw a line below them. Begin at the right hand, and take each figure in the lower line from the figure above it, setting down the remainder; but if the figure in the lower line be greater than that above it, first borrow, or add, 10 to the upper one, and then take the lower figure from that sum, setting down the remainder, and carrying 1, for what was borrowed, to the next lower figure; with which proceed through the line as before, and the sum is done.

PROOF.

Add the remainder and the less line together, and if right the total will be the same as the top line.

This rule, then, being the reverse of Addition, is worked by taking a little from much and

SHOWING THE DIFFERENCE.

But as you borrow (here if it require) what you stopped at there, always remember to pay it to the next,

AND SETTLE YOUR ACCOUNT.

	£.	CWT.	YDS.	ELLS.	GALLONS.
From......	271	4754	42087	452705	271508
Take......	154	2752	34096	427616	152471
Rem.......	117				
Proof ...	271				

913497	813864	918647	3750215
179359	179179	183916	3150974

967916	768109	851497	5189652
176591	87565	74616	4087965

918645	358746	631874	9784162
89174	174918	99157	4195873

783916	810636	910387	1208067
178709	785297	491608	924853

746210878	487166084	412766418
210497163	109167213	94216428

192166108	321087264	910421667
42108726	137210472	148266104

817216104	34266814	109090909
142916725	32172684	90909090

421632918	521066804	721083721
142668104	172610482	142681047

123456789	123456789	304726555
98765432	99999999	147008271

From 7210438 take 127314.

From one million take 61.

What is the difference between 2476987 and 821047?

Find the difference between 160 thousand and 160.

What will remain after taking 641 from 6966?

If you had a bag with a million marbles in it, and you were to lose one hundred and eighty-three thousand and thirteen; how many would be left?

If a baker has made for sale 17843 ship biscuits, and has sold 4906; how many are left?

If there are 784651 letters in a book, and 50099 of these in the first 20 pages; how many in the rest of the book?

A merchant had five debtors, A, B, C, D, and E; who together owed him £1156: B, C, D, and E owed him £737; what was A's debt?

What is the difference between the age of a man born in 1790, and another born in 1814?

Multiplication.

ULTIPLICATION teaches how to find the amount of any given number when repeated a certain number of times; as 7 times 8, which is 56; or 9 times 7, which is 63: thus compendiously performing the office of many additions.

To this important rule belong three essential or principal members, viz.

1. The *multiplicand,* or number to be multiplied.

2. The *multiplier*, or that by which you multiply.

3. The *product*, or number produced by multiplying.

RULE.—Begin with the figure that stands in the unit's place of the multiplier, and with it multiply the first figure in the unit's place of the multiplicand; set down the units, and carry the tens in mind, till you have multiplied the next figure in the multiplicand by the same figure in the multiplier; to the product

of which add the tens you kept in mind, setting down the units, and proceed as before, till the whole line is finished.

PROOF.

The usual way is performed as follows :—

Cast out the nines from the multiplicand and the multiplier, and place each remainder on opposite sides of a cross; then multiply them together, and divide their product by nine, and what is over place at the top of the cross; lastly, cast the nines from the product of the question, and place the overplus at the bottom; if the top and bottom figures are alike, the work is supposed to be correct; though they may correspond when it is wrong. The surest method is, to divide the product by the multiplicand, and the quotient will be the same as the multiplier.

EXAMPLE.

Multiply	3542		or Multiply	6196
by	6196		by	3542

	21252	Proof.	12392
	31878		24784
	3542		30980
	21252		18588

Proof.

2
5 4
2

Product   21946232   21946232 *Proof*

NOTE.—The above method of proof depends on a property of the number 9, which, except the number 3, belongs to no other digit whatever; namely, that "any number divided by 9, will leave the same remainder as the sum of its figures or digits divided by 9."

But before proceeding to any operations in this
rule, it is necessary to commit thoroughly to memory
the following table of all the products of the first 12
numbers, commonly called the

MULTIPLICATION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

Multiplicand...25104736   *Multiply* 82470936
Multiplier   2   *by*...............   2

Product 50209472   *Answer* ....

Multiply 52471021 by 3	*Multiply* 79254375 by 4
27104107 by 5	23103796 by 6
70625268 by 7	37231046 by 8
42144065 by 9	27010472 by 10
31041715 by 11	35210895 by 12

When the Multiplier is more than 12 and less than 20,

Multiply the multiplicand by the unit's figure in the multiplier, and add the back figure to the product, of which put down the units, and carry the tens to the next; repeat the same through the line, adding the last tens to the last figure in the multiplicand.

Multiply......... 4710572	*Multiply* 5639274
by............... 13	*by* 13
Product 61237436	*Answer* ......

Multiply 510752 by 14	*Multiply* 6653210 by 15
9205716 by 16	6251721 by 17
9215324 by 18	2571341 by 19

When the Multiplier consists of several Figures,

There must be as many products as there are figures in the multiplier, observing to place the first figure of every product under the figure you multiply by; add the several products together, and the total will be the answer.

Multiply 271041 by 27	*Ans.* 7318107
356958 by 43	*Ans.* 15349194
695837 by 79	*Ans.* 54971123
637526 by 247	*Ans.* 157468922
27501976 by 271	*Ans.* 7453035496
2714032 by 375	*Ans.* 1017762000
68274625 by 8536	*Ans.* 582792199000

When Ciphers are among the Figures in the Multiplier,

They may be either omitted in the work, or placed under where they are in the multiplier; then multiply by the next figure, and put the product on the left of the ciphers; proceed with the other figures in the multiplier in like manner: the total of the whole is the answer.

Multiply 83509583 by   408   *Ans.* 34071909864
         95036743 by   709   *Ans.* 67381050787
         78395438 by   5308   *Ans.* 416122984904
           571204 by   27009   *Ans.* 15427648836
        7561240325 by 57002   *Ans.* 431005821005650
         562710934 by 590030   *Ans.* 332016332388020

When Ciphers are at the end of the Multiplicand, or Multiplier, or both of them,

They may be omitted in the work, and the question worked as usual; but the number of ciphers left out, must be placed on the right hand of the total product.

Multiply   3692500 by   43500   *Ans.* 160623750000
          74837000 by   97500   *Ans.* 7296607500000
           8197148 by 807900   *Ans.* 6622475869200
          76159600 by 873080   *Ans.* 66493423568000
          92897500 by 908650   *Ans.* 84411313375000

When the Multiplier is a Composite Number, that is two figures being multiplied together make the Number,

Multiply the multiplicand by either of the two figures, and that product by the other, will give the answer.

Multiply   771039 by 35   *Ans.* 26986365
          6580048 by 72   *Ans.* 473763456
          95364739 by 132   *Ans.* 12588145548
           7984956 by 144   *Ans.* 1149833664

Division of Integers.
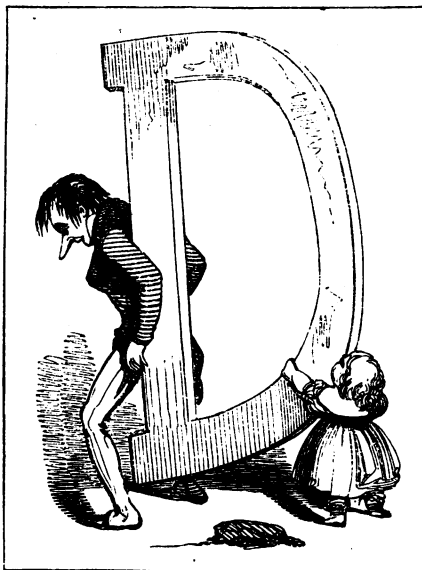
IVISION is a kind of compendious mode of Subtraction, teaching to find how often one number is contained in another, or may be taken from it; or to divide any number into as many parts as you require.

In this rule there are three numbers that are real, and a fourth accidental, viz.
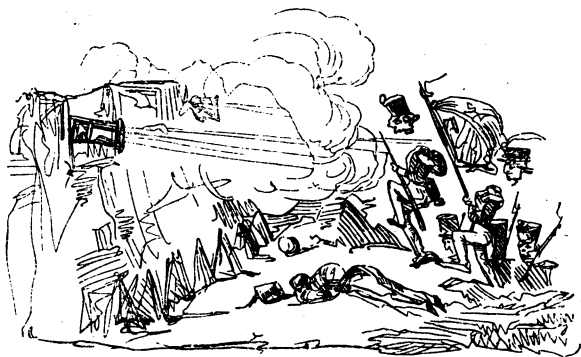
1. The *dividend,* or number to be divided.

2. The *divisor,* or number by which you divide.

3. The *quotient,* or number that shows how often the divisor is contained in the dividend.

4. The *remainder,* or accidental number (if any), is

WHAT IS OVER WHEN THE WORK IS FINISHED.

It is always less than the divisor, and of the same name as the dividend.

DIVISION consists of two parts, viz.

1. *Short Division,* is where the divisor does not exceed 12, or is either a composite number, or a single figure with ciphers annexed to it.

2. *Long Division,* is when the divisor exceeds 12,

and is not a composite number; it includes all divisors of questions that cannot be performed by Short Division.

SHORT DIVISION.

RULE.—When the divisor does not exceed 12, find how often it is contained in the first figure of the dividend; or if the first figure be less, take two figures; set down the number, and carry the overplus (if any) to the next in the dividend, as so many tens; then find how often the divisor is contained therein, set it down, and continue the same through the line, and if any number be over, it is called the remainder.

PROOF.—Multiply the quotient by the divisor, taking in the remainder, and the product will be the same as the dividend.

$$\text{Divisor } 2)\,8928427 \text{ Dividend}$$

$$\text{Quotient } 4464213 - 1 \text{ Remainder}$$
$$2$$

$$\text{Proof } 8928427$$

Divide	725107	by 2	Divide	6598336	by	10
	695368	by 3		5906308	by	11
	759654	by 4		7385076	by	12
	720328	by 5		9583864	by	50
	523103	by 6		35942874	by	400
	7203287	by 7		93859128	by	900
	2547325	by 8		65486340	by	1100
	2504730	by 9		93547158	by	1200

When the Divisor is a Composite Number,

Find what two numbers, being multiplied together,

make the number; then divide the dividend by either of them, and that quotient by the other, will give the quotient required. If there be a remainder to the first line, and none to the second, that remainder is the true one; but it sometimes happens there is a remainder to each of them, and as neither is right, the true one is thus discovered:

RULE.—Multiply the first divisor into the last remainder, and to that product add the first remainder.

$$16 \begin{cases} 2)\,89347397 \text{ by } 16 \\ \overline{} \\ 8)\,44673698{-}1 \\ \overline{} \\ 5584212{-}2 \end{cases} \Bigg\} 5 \; rem.$$

Divide		Divide	
310473	by 27	8165913	by 77
7210486	by 35	3185958	by 84
6251043	by 42	3958747	by 96
5761034	by 54	9150065	by 108
9174835	by 56	7398758	by 121
9958748	by 64	9083075	by 144

LONG DIVISION.

Find how many times the divisor is contained in an equal number of figures on the left hand of the dividend; but if the first figure of the divisor be larger than the first in the dividend, take one figure more, and place the number of times in the quotient.

Multiply the divisor by the quotient figure, and place the product under the dividend; subtract one from the other, and bring down the next figure in the dividend, place it after the remainder, and proceed as before.

When the figure is so brought down, and the remainder is then less than the divisor, place a cipher in the quotient, and bring down another, or as many more as

may be found requisite, till it will divide, remembering
to put a cipher in the quotient for each so brought down;
continue in the same manner till the whole is done.

PROOF.—As in Short Division.

To prove Division with the Cross.

Cast the nines from the divisor and the quotient, and
place each excess on opposite sides of a cross; multiply
them together, and divide the product by nine, and what
is over add to the remainder of the question, rejecting
the nines, and place the excess at the top of the cross;
then cast the nines from the dividend, and place the
excess at the bottom; if the top and bottom figures are
the same, the sum is supposed to be right; but it may
prove by this method when wrong.

Divisor.	Dividend.	Quotient.
29)	4172	(143
	29	29
	127	1292
	116	288
	112	4172 *Proof.*
	87	
	25	

Those well versed in Divi-
sion may omit the products of
the divisor by each quotient
figure, by subtracting as they
proceed.

$$2 \diagtimes^{5}_{5} 8$$

EXAMPLE.

29) 4172 (143
127
112
25

Divide 739156 by 31   *Divide* 42749467 by 347
3150716 by 45   75383576 by 975
6935858 by 57   36085052 by 1034
1372815 by 92   165047840 by 5471
9638573 by 105   4973401891 by 51088
3963854 by 285   51701647874 by 476504
9308567 by 315   1745379894612 by 314794

D

When Ciphers are at the end of the Divisor,

Cut them off with a comma, and also as many places from off the dividend, and divide as usual; then annex the figures that were cut off from the dividend to the remainder.

PROOF.—As before.

$$\begin{aligned}
\textit{Divide} \quad & 25473231 \text{ by } 271000 \\
& 752474729 \text{ by } 273000 \\
& 725347216 \text{ by } 572100 \\
& 6325104997 \text{ by } 7215000
\end{aligned}$$

P.Cruik s.
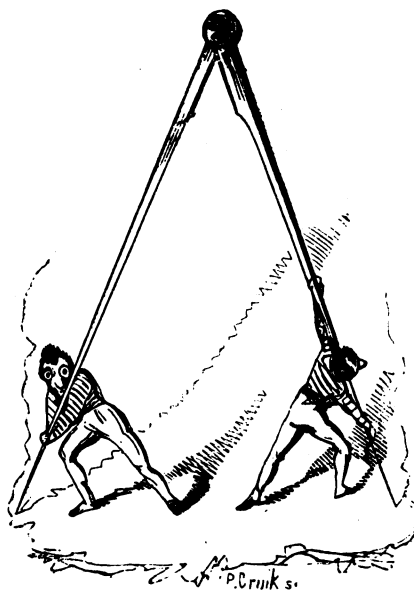
SIMPLE DIVISION.

TABLES

OF

MONEY, WEIGHTS, MEASURES, & TIME.
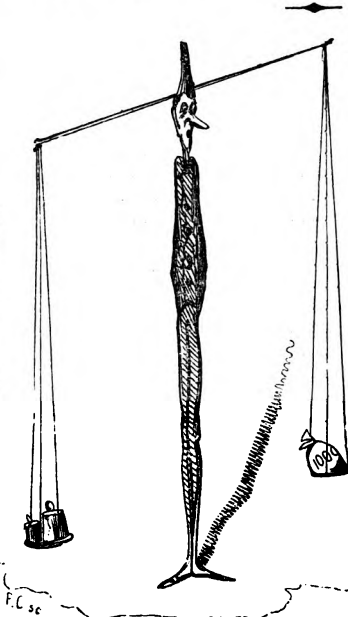
HE value sterling of a

	£.	s.	d.
Piastre is	0	0	2½
Real	0	0	5¼
Franc	0	0	10
Florin ...	0	1	8
Ducat	0	3	4
Ruble	0	3	4
Dollar	0	4	6
Milreis...	0	4	8
Crown....	0	5	0
Noble	0	6	8
Angel	0	10	0
Mark......	0	13	4
Guinea ...	1	1	0
Carolus...	1	3	0
Jacobus...	1	5	0
Moidore ..	1	7	0
Rupee	0	2	0
Tale	0	6	8

STERLING MONEY.

4 Farthings	make	1 Penny	d
12 Pence	,,	1 Shilling	s
20 Shillings	,,	1 Pound	£

NOTE.—£ denotes pounds, from *libræ*, the Latin for pounds; *s* shillings, from *solidi*; *d* pence, from *denarii*; *q* farthings, from *quadrantes*.

¼ denotes one farthing, or one quarter of any thing.
½ denotes a halfpenny, or the half of any thing.
¾ denotes three farthings, or three quarters of any thing.

SHILLINGS AND PENCE TABLE.

FARTHINGS.		PENCE.			SHILLINGS.		
q.	*d.*	*d.*	*s.*	*d.*	*s.*	*£.*	*s.*
4	1	12	1	0	20	1	0
5	1¼	20	1	8	30	1	10
6	1½	24	2	0	40	2	0
7	1¾	30	2	6	50	2	10
8	2	36	3	0	60	3	0
9	2¼	40	3	4	70	3	10
10	2½	48	4	0	80	4	0
11	2¾	50	4	2	90	4	10
12	3	60	5	0	100	5	0
13	3¼	70	5	10	110	5	10
14	3½	72	6	0	120	6	0
15	3¾	80	6	8	130	6	10
16	4	84	7	0	140	7	0
17	4¼	90	7	6	150	7	10
18	4½	96	8	0	160	8	0
19	4¾	100	8	4	170	8	10
20	5	108	9	0	180	9	0
22	5½	110	9	2	190	9	10
24	6	120	10	0	200	10	0

The usual value of gold is nearly 4*l.* per ounce, or 2*d.* a grain; and that of silver is nearly 5*s.* an ounce. Pure gold, free from mixture with other metals, is of so pure a nature, that it will endure the fire without wasting, though it be kept continually melted. But silver, not having the purity of gold, will not endure the fire like it : yet fine silver will waste but a very little by being in the fire any moderate time; whereas copper, tin, lead, &c. will not only waste, but may be calcined, or burnt to a powder. ˙

Both gold and silver, in their purity, are so soft and flexible, that they are not so useful, either in coin or otherwise, (except to beat into leaf gold or silver) as when alloyed, or mixed and hardened with copper or brass. In England the standard for gold and silver coin is,—22 parts of fine gold, and 2 parts of copper, melted together : 11 ozs. and 2 dwts. of fine silver, and 18 dwts. of copper, melted together ; and which may be regarded as the true standard for Sterling money.

WEIGHTS AND MEASURES.

MEASURE OF CAPACITY.

MEASURE is a more comprehensive term than WEIGHT, and it is distinguished into six kinds, viz.

Measure of
1. Length.
2. Surface.
3. Solidity, or Capacity.
4. Force of Gravity, commonly called Weight.
5. Angles.
6. Time.

The several denominations of these Measures have reference to certain standards, which are entirely arbitrary, and vary among different nations. In Great Britain

The standard of
Length is a Yard.
Surface is a Square Yard.
Solidity is a Cubic Yard.
Capacity is a Gallon.
Weight is a Pound.

The standards of Angular Measure and of Time, are the same in all European, and most other countries.
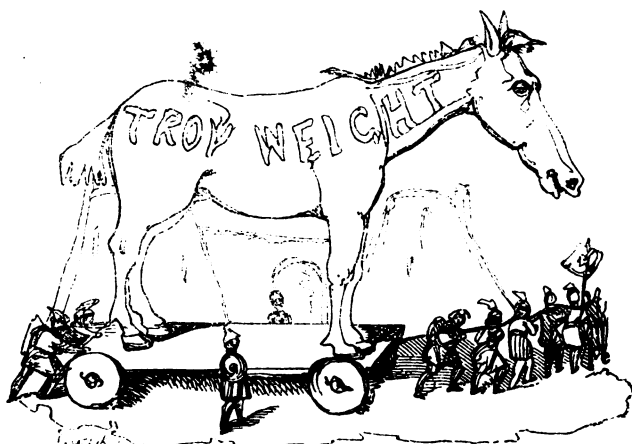
TABLE.

24 Grains	make	1 Pennyweight (dwt.)
20 Pennyweights	,,	1 Ounce (oz.)
12 Ounces	,,	1 Pound (lb.)

These are the denominations of Troy Weight when used for weighing gold, silver, and precious stones (except diamonds).

APOTHECARIES' WEIGHT.

20 Grains	make	1 Scruple.
3 Scruples	,,	1 Drachm.
8 Drachms	,,	1 Ounce.
12 Ounces	,,	1 Pound.

This weight is used by Apothecaries in compounding medicines, but they buy and sell their drugs by avoirdupois weight. They also use the following liquid measure :—60 minims or drops 1 fluid drachm, 8 fluid drachms 1 fluid ounce, 12 fluid ounces 1 pound.

AVOIRDUPOIS WEIGHT.
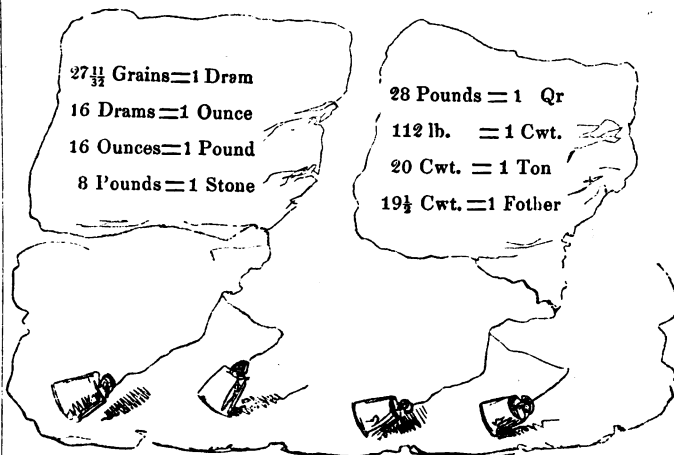
$27\frac{11}{32}$ Grains = 1 Dram

16 Drams = 1 Ounce

16 Ounces = 1 Pound

8 Pounds = 1 Stone

28 Pounds = 1 Qr

112 lb. = 1 Cwt.

20 Cwt. = 1 Ton

$19\frac{1}{2}$ Cwt. = 1 Fother

TABLE.

Drams.					
16 =	1 Ounce.				
256 =	16 =	1 Pound.			
7168 =	448 =	28 =	1 Quarter.		
28672 =	1792 =	112 =	4 =	1 Hundred Weight.	
573440 =	35840 =	2240 =	80 =	20 =	1 Ton.

By this Table are weighed all commodities that are subject to waste; as Grocery and Chandlery wares, Provisions in general, and all Metals but silver and gold.

By comparing the number of grains in the Avoirdupois and Troy pound and ounce respectively, it appears that the Troy pound is less than the Avoirdupois, in the proportion of 14 to 17 nearly; but the Troy ounce is greater than the Avoirdupois, in the proportion of 79 to 72 nearly.

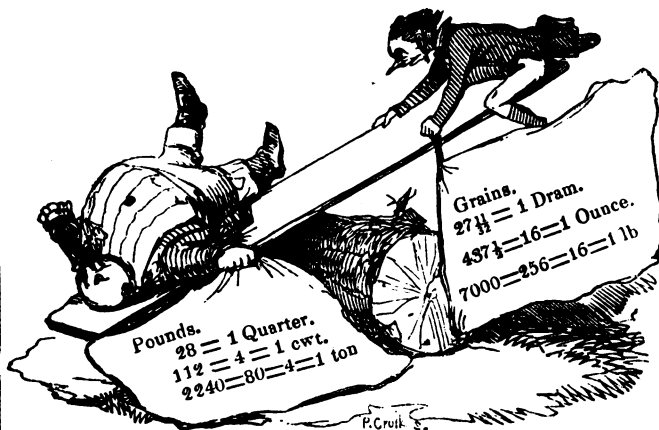| 1 lb. Avoirdupois	=	14 oz.	11 dwt.	$15\frac{1}{2}$ gr.	Troy.
1 oz. ,, ,,	=	0	18	$5\frac{1}{2}$	,,
1 dr. ,, ,,	=	0	8	$3\frac{1}{2}$	,,

For scientific purposes the grain only is used; and sets of weights are constructed in decimal progression from 10,000 grains downwards to $\frac{1}{100}$ of a grain.

The *carat*, used for weighing diamonds, is $3\frac{1}{6}$ grains. The term, however, when used to express the fineness of gold, has a relative meaning only. Every mass of alloyed gold is supposed to be divided into 24 equal parts: thus the standard for coin is 22 carats fine; that is, it consists of 22 parts of pure gold, and 2 parts of alloy. What is called the *new standard*, used for watch-cases, &c., is 15 carats fine.

THE LESSER AND GREATER WEIGHT.

Grains.
$27\frac{11}{32} = 1$ Dram.
$437\frac{1}{2} = 16 = 1$ Ounce.
$7000 = 256 = 16 = 1$ lb

Pounds.
$28 = 1$ Quarter.
$112 = 4 = 1$ cwt.
$2240 = 80 = 4 = 1$ ton

P. Cruik

WEIGHT OF A FOTHER OF LEAD

AT SUNDRY PLACES.

At London	19½ cwt.		At Newcastle	21 cwt.
Leith	20 cwt.		Chester	21 cwt 1 qr. 20lb
Hull	20 cwt. 3 qr. 16 lb.		Stockton	22 cwt.

P. CTUI̠k sc
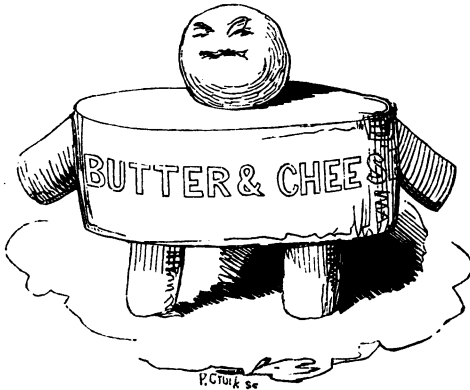
8 Pounds	make	1 Clove.
32 Cloves, or 256 lb.	,,	1 Wey in Suffolk.
42 Cloves, or 336 lb.	,,	1 Wey in Essex.
56 Pounds	,,	1 Firkin of butter.

Some goods are sold not only by the cwt., lb., &c., but in particular quantities, or in packages of a certain weight, as

	lbs.		lbs.
A firkin of soap	64	A peck of flour or salt	14
A barrel of soap	256	A sack of flour	280
,, candles	120	,, potatoes	228
,, anchovies	30	,, coals	224
,, raisins	112	A bag of rice	168
,, gunpowder	112	A puncheon of prunes	1120
,, potash	200	A chest of tea	84
A stone of glass	5	A gallon of train oil, 7 lb. 6 oz.	
,, meat or fish	8	A tun of linseed oil	16 cwt.
,, wool or shot	14	A pocket of hops	112 lb.
,, hemp	32	A bag of hops	250 lb.
A quintal of fish	100	A last of herrings	12 barrels.
A faggot of steel	120	,, salt	18 cwt.
A seam of glass	120	,, feathers	17 cwt.
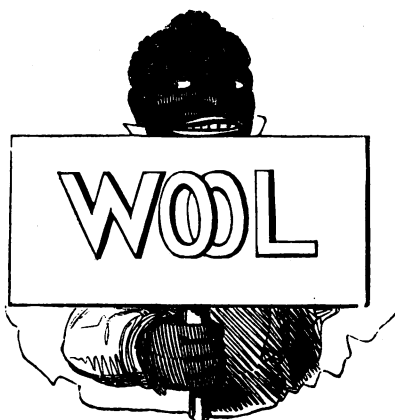
| 14 Pounds | make | 1 legal Stone. |
| 2 Stones, or 28 lbs. ,, | | 1 Tod. |

ALSO,

| 16 Pounds | make | 1 customary Stone. |
| 15 Stones, or 8 tods | ,, | 1 Pack of 240 lb. |

| 1 Clove of wool | 7 lb. | 1 Sack, or 2 weys | 364 lb. |
| 1 Wey, or 6½ tods | 182 lb. | 1 Last, or 12 sacks | 4368 lb. |

In purchasing wool from the grower, 28 lb. make a legal tod; but woolstaplers, in their transactions with each other and with manufacturers, allow 30 lb. to the tod, and 8 tods to the pack.

HAY AND STRAW.

A Truss of straw	36 lb.	36 Trusses	...	1 Load.
,, old hay	56 lb.	1½ Loads	...	1 Ton.
,, new hay	60 lb.			

Silks are weighed, some 24 oz., others 16 oz. to the lb. 25 lb. is a qr. cwt., 100 lb. 1 cwt., 20 cwt. 1 ton of gold or silver. A bushel of coal is 88 lb.: a bushel of flour 56 lb.

LONG, OR LINEAL MEASURE.

HIS Measure respects length only, and is used in taking the distance from one place to another. An Inch is the smallest lineal measure to which a name is given; but sub-divisions are used for many purposes. Among mechanics the inch is usually divided into *eighths:* by the officers of the revenue, and scientific persons, it is divided into *tenths, hundredths,* &c.

The length of 3 barley-corns was formerly reckoned an inch; but a barley-corn is no measure. The inch was also made to consist of 12 parts, called *lines,* but these have properly fallen into disuse.

Land is measured by a chain of 4 poles long, which is 22 yards, or 66 feet; and contains 100 links. Ten chains in length, and one in width, make an acre.

LONG MEASURE.

12 Inches	make	1 Foot.
3 Feet	,,	1 Yard.
2 Yards, or 6 feet		1 Fathom.
5½ Yards	,,	1 Pole or Rod.
40 Poles	,,	1 Furlong.
8 Furlongs	,,	1 Mile.
3 Miles	,,	1 League of sea.
69½ Miles	,,	1 Degree.

The mile in England contains 1760 yards, but its length varies in different countries; in Russia it is 1100 yards, in Italy 1467, Scotland and Ireland 2200, in Poland 4400, Spain 5028, Germany 5866, Denmark and Sweden 7233, Hungary 8800. In France they reckon by leagues; the small league 2933 yards, the mean league 3666, and the great league 4400.

SQUARE AND LAND MEASURE.

This measure respects both length and breadth, and is used by artificers in computing the contents of their work.

144 Square Inches	make	1 Sq. Foot.
9 Square Feet	,,	1 Sq. Yard.
30¼ Square Yards	,,	1 Sq. Pole or Perch.
40 Poles	,,	1 Rood.
4 Roods	,,	1 Acre.
640 Acres	,,	1 Square Mile.

In Carpentry, 100 superficial feet make a square.

A square yard is the $\frac{1}{4840}$ of an acre.

Particular Measures of Length.

3 Inches	make	1 Palm.
4 Inches	,,	1 Hand, for the height of horses.
9 Inches	,,	1 Span.
18 Inches	,,	1 Cubit.

CLOTH MEASURE.

YARD regulates every Measure, whether lineal, superficial, or solid.

The French ell of six quarters, and the Flemish ell of three quarters, once in use as a measure for certain kinds of goods, is no longer employed in the commerce of this kingdom.

A Yard Dog.

TABLE.

$2\frac{1}{4}$ Inches	make	1 Nail.
4 Nails	,,	1 Quarter.
4 Quarters	,,	1 Yard.
5 Quarters	,,	1 Ell.

This table is used to measure woollen and linen goods, carpets, oil-cloths, wrought silks, ribbons, lace, &c.

30 acres constitute a Yard of land; 100 acres 1 Hide; 40 hides a Barony.

$272\frac{1}{4}$ feet, or $30\frac{1}{4}$ yards, is 1 rod of brickwork.

A cubic foot of water weighs 1000 ounces, Avoirdupois.

E

P. C. Tuck.

HOGSHEAD AND PIPE.

WINE AND SPIRIT MEASURE.

2 Quarterns, or gills	make	1 Halfpint.
2 Halfpints, or 4 gills	,,	1 Pint.
2 Pints	,,	1 Quart.
4 Quarts, or 8 pints	,,	1 Gallon.
10 Gallons	,,	1 Anker of Brandy.
18 Gallons	,,	1 Runlet.
42 Gallons	,,	1 Tierce.
63 Gallons	,,	1 Hogshead.
84 Gallons	,,	1 Puncheon.
2 Hogsheads	,,	1 Pipe or Butt.
2 Pipes	,,	1 Tun.

By this measure all wines, spirits, perry, cider, mead, vinegar, honey, and oils, are measured. A gill in London is a quarter of a pint, but in many places half a pint.

The alteration made by the late Act for regulating Weights and Measures, is chiefly confined to this and the two following Tables, the same gallon being now used for wines, spirits, ale and beer, dry goods, &c.

ALE & BEER MEASURE.
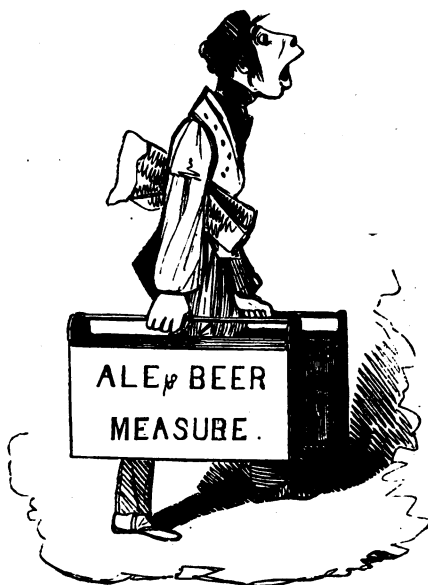
TABLE.

2 Pints	make	1 Quart.
4 Quarts	,,	1 Gallon.
9 Gallons	,,	1 Firkin.
2 Firkins	,,	1 Kilderkin.
2 Kilderkins	,,	1 Barrel.
1½ Barrels, or 54 gallons		1 Hogshead.
3 Barrels, or 2 hogsheads		1 Butt.

In London they computed formerly but 8 gallons to the firkin of ale, and 32 gallons to the barrel; at present, in all parts of England, for ale, strong beer, and small, 36 gallons are a barrel, and 9 gallons a firkin.

The Imperial Gallon contains exactly 10 lbs. Avoirdupois of pure water: consequently the pint will hold 1¼ lb., and the bushel 80 lbs.

The old measures for liquids and dry goods are abolished, the new IMPERIAL GALLON being now used for both. For liquids several denominations have been customarily in use; viz., for Beer—the Firkin of 9 gallons, the Kilderkin of 18, the Barrel of 36, the Hogshead of 54, and the Butt of 108 galls. These will probably continue in practice. For Wine and Spirits there are, the Anker, Runlet, Tierce, Hogshead, Puncheon, Pipe, Butt, and Tun; but these may be considered rather as the names of the casks in which such commodities are imported, than as expressing any definite number of gallons. It is the practice to gauge all such vessels, and to charge them according to their actual contents.

The Imperial Measures were established by Act 5 Geo. IV. c. 74. Before that time there were four different measures of capacity used in England.—1. For wine, spirits, cider, oils, milk, &c.; this was one-sixth less than the Imperial Measure. 2. For malt liquors; this was $\frac{1}{59}$ part greater than the Imperial Measure. 3. For corn, and all other dry goods not heaped; this was $\frac{1}{33}$ part less than the Imperial Measure. 4. For coals, which did not differ sensibly from the Imperial Measure.

Pipes and hogsheads vary considerably in quantity, according to the kinds of wine they contain, viz.

A hogshead of Tent 52 galls.	Pipe of Teneriffe .. 100 galls.
„ Cape.. 92 „	Butt of Malaga .... 105 „
„ Claret 46 „	„ Sherry .... 108 „
Pipe of Madeira .. 92 „	„ Port ...... 115 „
„ Sicilian.... 93 „	„ Lisbon .... 117 „
„ Vidonia.... 100 „	Aum of Hock .... 36 „

Many wines are sold in bottles only.

COMPARISON OF MEASURES.

The old *ale* gallon contained 282 cubic inches.
The old *wine* gallon contained 231 cubic inches.
The old *Winchester* bushel contained 2150⅔ cubic inches.
The *Imperial* gallon contains 277·274 cubic inches.
The *corn* bushel contains eight Imperial gallons.

CORN, OR DRY MEASURE.

2 Pints	make	1 Quart.
4 Quarts, or 8 pints	„	1 Gallon.
2 Gallons, or 8 quarts	„	1 Peck.
4 Pecks, or 8 gallons	„	1 Bushel.
2 Bushels	„	1 Strike.
4 Bushels	„	1 Coomb.
2 Coombs, or 8 bushels		1 Quarter.
5 Quarters, or 40 bushels		1 Wey or Load.
2 Weys, or 10 quarters	„	1 Last.

This measure is so called, as it is used principally for dry commodities, such as wheat, barley, and grain in general; sand, salt, fruit, oysters, &c.

All goods measured by the new bushel, which are not heaped, are to be stricken by a straight roller.

The standard bushel is 19¼ inches diameter, and contains 2218¼ cubic inches.

Flour is sold nominally by measure, but actually by weight, reckoned at 7lb. Avoirdupois to a gallon.

A person unacquainted with Land Measure may compute the contents of a garden or field, that is either a square or an oblong square, by multiplying its length in yards by the breadth, and the proportion the product bears to 4840, the square yards in an acre, will be the answer.

A stack of wood is 12 feet in length, 3 feet in breadth, and 3 deep $=$ 108 solid feet; or commonly, 14 feet long, 3 feet 1 inch broad, and 3 feet 1 inch deep.

Firewood is sold by the billet of 3 feet long, either by measurement, or by the 100 of 6 score. By the faggot of 3 feet long, and 2 feet round, 50 of which are a load; or if round large pieces, such as cleft roots, &c., by the cord, which is a solid pile of 8 feet long, 4 feet wide, and 4 feet high $=$ 128 solid feet. This quantity weighs about half a ton, and is equal to 1000 billets, or about half a ton of coals.

Coals were formerly sold by the bushel, the sack of 3 bushels, and the chaldron of 12 sacks. They are now sold by the cwt., ton, &c. A barge load weighs about 21 tons 4 cwt.; a collier or ship load 20 such keels, or about 424 tons.

In the Iron and Coal trade there are two denominations of Cwts.; the one called the *Long* Hundred, which contains 120 lbs. Avoirdupois, and the other called the *Short* Hundred, which contains 112 lb.

A dozen is 12 in number; a score 20; a gross 12 dozen; a hundred 5 score; a quire of paper 24 sheets; a ream 20 quires; a bundle 2 reams. Some articles are sold by the long hundred of 6 score. Plain cards are sold by the pack of 52. 1 dozen skins of parchment 1 roll. The size of books and paper is according to the manner of doubling a sheet— thus, if a large sheet be doubled once, so as to make but 4 pages, it is called folio (fol.); half this size is quarto (4to.) as letter-paper is of a quarto size; this doubled again, making 16 pages to the sheet, is octavo (8vo.); if so doubled as to make 24 pages to a sheet, it is duodecimo (12mo.); 36 pages to a sheet is octodecimo (18mo.) &c. Lawyers reckon their writings at per sheet of 72 words.

HEAPED MEASURE.

H E Bushel here is the same as in Corn Measure.— It is a vessel of a circular form, $19\frac{1}{2}$ inches in diameter, and $8\frac{1}{4}$ inches deep. Upon this measure the articles are to be heaped in the form of a cone, at least 6 inches high, and the outside of the bushel to be the extremity of the base. This measure is used for coals, culm, lime, fish, potatoes, fruit, &c.

TABLE.

2 Gallons	make	1 Peck.
8 Gallons	,,	1 Bushel.
3 Bushels of Coals	,,	1 Sack.
12 Sacks, or 36 bushels		1 Chaldron.
21 Chaldrons	,,	1 Score.

The outside diameter of Measures to be at least double the depth; consequently not less than the following dimensions:

Bushel	$19\frac{1}{2}$ inches.	Gallon	$9\frac{3}{4}$ inches.
Half-bushel	$15\frac{1}{2}$,,	Half-gallon	$7\frac{3}{4}$,,
	Peck	$12\frac{1}{4}$ inches.	

INVOLUTION.

No.	Square.	Cube.	No.	Square.	Cube.
1	1	1	7	44	343
2	4	8	8	64	512
3	9	27	9	81	729
4	16	64	10	100	1000
5	25	125	11	121	1331
6	36	216	12	144	1728

DIGGING.

24 Cubic feet of sand, or 18 cubic feet of earth, or 17 cubic feet of clay, make 1 ton.

1 Yard cube of solid gravel or earth contains 18 heaped bushels before digging, and 27 heaped bushels when dug.

27 Heaped bushels make 1 load.

TABLES FOR MENTAL RECKONING.

BY THE DOZEN AND GROSS.

Things at $\frac{1}{4}d.$ each, are　3d. per doz., and　3s. a gross.

$\frac{1}{2}$ .... „ ....6 .... „ ...... 6 　„

$\frac{3}{4}$ .... „ ....9 .... „ ...... 9 　„

1d. .. „ ....1s. .. „ ...... 12 　„

And as many Pence as any one thing is worth, so many Shillings is a dozen worth.

BY THE SCORE.

At $\frac{1}{4}d.$ each, is　5d. a score. | At 3d. each, is　5s. 0d. a score.

$\frac{1}{2}$ .... 10 　„ | 4 .... 6　8 　„

$\frac{3}{4}$ ...... 1s. 3d. 　„ | 5 .... 8　4 　„

1d....... 1　8 　„ | 6 ...... 10　0 　„

2 ..... 3　4 　„ | 8 ...... 13　4 　„

BY THE CWT. OR TON.

At $\frac{1}{4}d.$ per lb., is　2s. 4d. per cwt., and　2l. 6s. 8d. per ton.

$\frac{1}{2}$ .... „ ....4　8 ...... „ ..... 4 13　4 　„

$\frac{3}{4}$ .... „ ....7　0 ...... „ ..... 7　0　0 　„

1d. .... „ ....9　4 ...... „ ..... 9　6　8 　„

2 ...... „ .. 18　8 ...... „ ....18 13　4 　„

3 ...... „ 1l. 8　0 ...... „ ....28　0　0 　„

4 ...... „ 1 17　4 ...... „ ....37　6　8 　„

5 ...... „ 2　6　8 ...... „ ....46 13　4 　„

6 ...... „ 2 16　0 ...... „ ....56　0　0 　„

LENGTH AND BREADTH.

CUBIC, OR SOLID MEASURE.

This measure includes length, breadth, and thickness, or depth. It is used in measuring earth, marble, gravel, stones, timber, and all artificers' works computed by their solid contents.

TABLE.

1728 Solid Inches	make	1 Cubic Foot.
27 Solid Feet	,,	1 Cubic Yard.
40 Feet of rough Timber, or	}	1 Ton or Load.
50 Feet of hewn Timber		
42 Cubic Feet	,,	1 Ton of Shipping.
277¼ Cubic Inches	,,	1 Imperial Gallon.
2218⅕ Cubic Inches	,,	1 Imperial Bushel.

TABLE.

60 Seconds	make	1 Minute.
60 Minutes	,,	1 Hour.
24 Hours	,,	1 Day.
7 Days	,,	1 Week.
4 Weeks	,,	1 Lunar Month.
12 Calendar Months, or 365 Days, 6 Hours ,,	}	1 Year.

Though the year is commonly reckoned 365 days, 6 hours, it is accurately ascertained to contain 365 days, 5 hours, 48 minutes, and 45½ seconds.

ANGULAR MEASURE.

60 Seconds	make	1 Minute.
60 Minutes	,,	1 Degree.
30 Degrees	,,	1 Sign of the Zodiac.
90 Degrees	,,	1 Quadrant.
360 Degrees	the Circumference of the Globe.
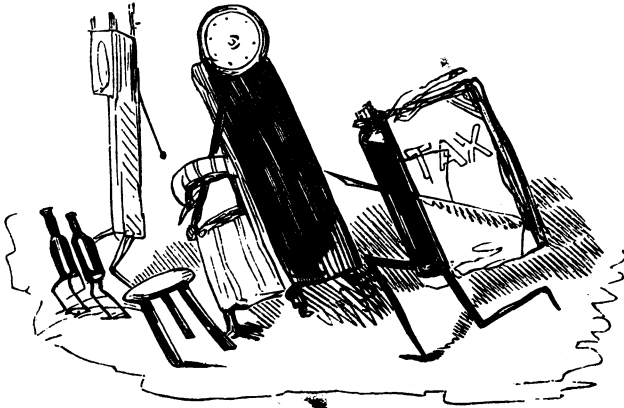
INK'EM-TAX DAY.

The Quarter Days are

Lady-day	... ...	25th March.
Midsummer-day	...	24th June.
Michaelmas-day	...	29th September.
Christmas-day	...	25th December.

To know the Days in each Month.

Thirty days hath September,
April, June, and November;
February hath twenty-eight alone,
All the rest have thirty and one;
Except leap-year, and then's the time
February's days are twenty-nine.

To know when it is Leap-Year.

Divide the year by four, and if there be no remainder, it is leap-year; but if any figure is over, it denotes the number of years since. Thus 1840, 1844, &c., divided by 4 leave no remainder, and are leap-years.

LADY DAY.

The Tropical, or Solar Year, is 365 days, 5 hours, 48 minutes, and 45¼ seconds.

A Siderial Year is 365 days, 6 hours, 9 minutes, 11 seconds.

The Lunar Month is 29 days, 12 hours and 44 minutes, which is the time the Moon occupies in effecting its changes.

13 months of 4 weeks and 1 day; or 52 weeks 1 day; or 365 days, make 1 year for three years together; but every fourth year contains 366 days, and is called Leap-Year : hence the Julian Year is 365 days and 6 hours at a mean.
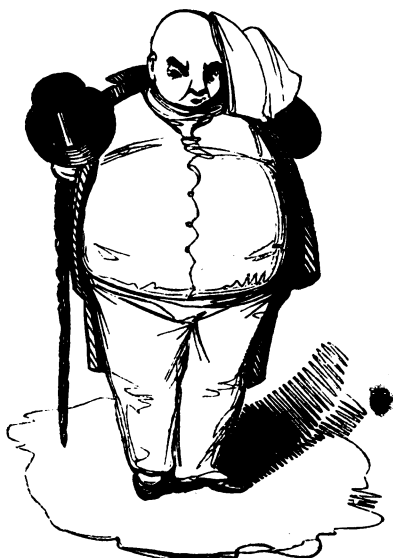
MIDSUMMER DAY.

The *astronomical day* is reckoned from noon to noon, and consists of 24 hours. This is called a *natural* day, being of the same length in all latitudes. The *artificial day*, is the time elapsed between the sun's rising and setting, and is variable according to the different latitudes of places. The *civil day*, like the astronomical or natural day, consists of 24 hours, but begins differently in different nations. The ancient Babylonians, Persians, Syrians, and most of the eastern nations, began their day at sun-rising; the Athenians, Jews, &c. at sun-setting, which custom is followed by the modern Austrians, Bohemians, Silesians, Italians, Chinese, &c. The Arabians begin their day at noon; the ancient Egyptians, Romans, &c. at midnight, and this method is followed by the English, French, Germans, Dutch, Spanish, and Portuguese.

F

MICHAELMAS DAY.

All countries on the face of the earth, in respect to time, equally enjoy the light of the sun, and are equally deprived of the benefit of it; that is, every inhabitant has the sun above his horizon for six months, and below it for the same period.

The Zodiac is an imaginary belt encompassing the heavens, and extending eight degrees on each side of the Ecliptic. It contains the paths of all the planets. The ecliptic and zodiac are divided into twelve equal parts called signs, each containing thirty degrees. The sun makes his apparent annual progress through the ecliptic at the rate of nearly a degree in a day. The names of the signs, and the days on which the sun enters them, are as follow:

CHRISTMAS DAY.

SPRING SIGNS.	SUMMER SIGNS.
♈ *Aries*, the Ram, 21st March.	♋ *Cancer*, the Crab, 21st June.
♉ *Taurus*, the Bull, 19th April.	♌ *Leo*, the Lion, 22nd of July.
♊ *Gemini*, the Twins, 20th May.	♍ *Virgo*, the Virgin, 22nd Aug.

These are called northern signs, being north of the equinoctial.

AUTUMNAL SIGNS.	WINTER SIGNS.
♎ *Libra*, the Balance, Sept. 23.	♑ *Capricornus*, the Goat, Dec. 21.
♏ *Scorpio*, the Scorpion, Oct. 23.	♒ *Aquarius*, the Water-bearer,
♐ *Sagittarius*, the Archer, 22nd	20th of January.
of November.	♓ *Pisces*, the Fishes, 19th Feb.

These are called southern signs.

The *fixed stars* are so called because they have usually been observed to keep the same distance with respect to each other. A *constellation* is an assemblage of stars on the surface of the celestial globe, circumscribed by the outlines of some assumed figure, as a *dragon*, a *bear*, &c. *Planets* are opaque bodies, similar to our earth, which move round the sun in certain periods of time. They shine not by their own light, but by reflection of the light which they receive from the sun.
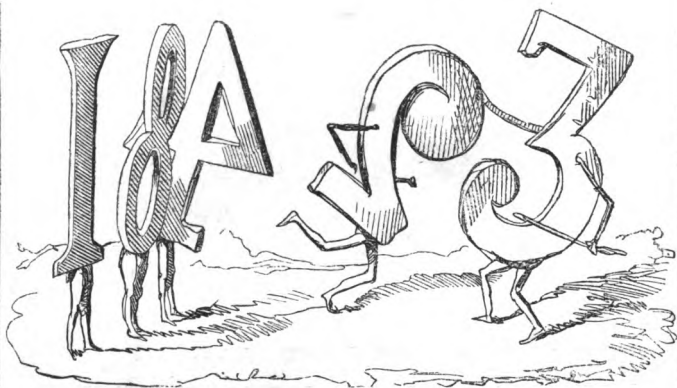

THE NEW YEAR TURNING OUT THE OLD.

The Chaldeans and Egyptians were the original inventors of Astronomy; they registered the events in their history and the mysteries of their religion among the stars by emblematical figures. The Greeks displaced many of the Chaldean constellations, and placed such images as had reference to their own history in their room. The same method was followed by the Romans: hence the accounts given of the signs of the zodiac, and of the constellations, are contradictory and involved in fable.

ADDITION

Of Several Denominations.
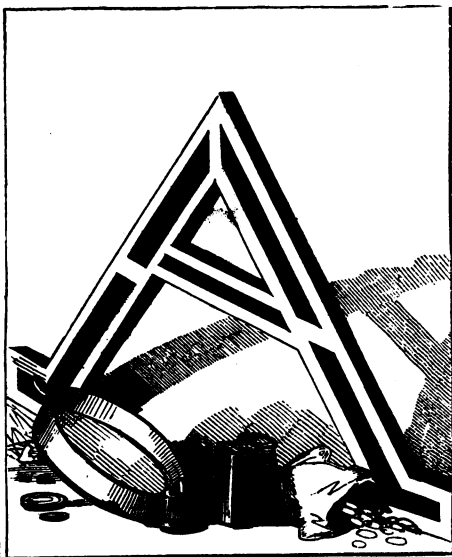
DDITION of Money, Weights and Measures, or Compound Addition, serves to add or collect several numbers of different denominations into one sum or amount.

RULE.—Add together the first row or denomination, as in integers, then divide that sum by as many of the same denomination as make one of the next greater, setting down the remainder under the row added, and carry the quotient to the next superior denomination, continuing the same to the last, which add as in Simple Addition.

PROOF.—As in Integers.

MONEY.

£.	s.	d.		£.	s.	d.		£.	s.	d.		£.	s.	d.
2	13	5½		27	7	2		35	17	5		75	3	7
7	9	4¼		34	14	7¼		59	14	7½		54	17	1½
5	15	4½		57	19	2¼		97	13	5¼		91	15	4¼
9	17	6¼		91	16	1		37	16	8¼		35	16	5¾
7	16	3		75	18	7¾		97	16	7		29	19	7¼
5	14	7¼		97	13	5		59	16	5½		91	17	3¼

£.	s.	d.		£.	s.	d.		£.	s.	d.		£.	s.	d.
257	1	5½		525	2	4¼		127	4	7½		261	17	1
734	3	7¾		179	3	5		525	3	5		379	13	5
595	5	3		250	4	7¼		271	0	5		257	16	7
152	14	7½		975	3	5¼		524	9	1		184	13	5
207	5	4		254	5	7		379	4	3½		725	2	3
798	16	7¾		379	4	5¾		215	5	8¾		359	6	3

£.	s.	d.		£.	s.	d.		£.	s.	d.		£.	s.	d.
127	4	7½		261	17	1¼		731	19	10¼		836	19	9¼
741	19	5¼		819	18	5½		87	17	7½		719	18	8
85	13	8		371	17	7½		819	8	8¼		784	17	9
916	18	5½		819	16	8		791	9	6		89	19	5
437	19	8		579	15	9¼		79	14	7½		58	15	7¾
351	14	7¾		178	18	10		38	18	8¾		719	19	4¾
794	17	4¾		31	17	8		819	19	7½		589	17	9½

APPLICATION.

Add £381. 10. 9½, £32. 17. 6, £185. 19. 3¼, £927. 19. 10¼, £82. 13. 9, and £31. 8. 3¾ together.

Ans. 1642. 9. 5¼.

A, B, C, and D, were partners in the purchase of a quantity of goods; A laid out £7, half a guinea, and a crown; B, 49s.; C, 54s. 6d.; and D, 87d.;—what was the sum expended? *Ans.* £13. 6. 3.

ADDITION OF MONEY.

Add £392. 8. 7¼, £3. 8. 6, £279. 2. 7¼, £0. 18. 2½, £271. 19. 5¼, £21. 10, £399. 13. 7¼, £1. 19. 3¼ together.

Bought a parcel of goods, for which I paid £54. 17s., the packing them 13s. 8d., carriage £1. 5s. 4d., and other expenses 14s. 3d.;—how much do the goods stand me in ?   *Ans.* £57. 10. 3.

A man lent his friend, at different times, these several sums, viz. £63, £25. 15s., £32. 7s., £15, £15. 14s. 10d., and four score and nineteen pounds, half a guinea, and a shilling; how much did he lend in all?   *Ans.* £236. 8. 4.

Add £3182. 19. 3¼, £374. 19. 3¼, £387. 16. 2, £380. 13. 9¼, £27. 10. 2, £369. 0. 3, £1. 19. 5, £339. 13. 6¼, and 30 guineas together.   *Ans.* £5096. 1. 10¼.

What is the estate worth per annum, when the taxes are 21 guineas, the neat income 8 score, £19. 14s ?   *Ans.* £201. 15s.

ADDITION OF WEIGHTS.

TROY WEIGHT.

oz. dwt. gr.	lb. oz. dwt.	oz. dwt. gr.	lb. oz. dwt.
3 . 12 . 19	5 . 7 . 17	14 . 12 . 17	31 . 7 . 13
5 . 17 . 13	3 . 3 . 19	17 . 9 . 19	27 . 3 . 19
7 . 9 . 5	9 . 5 . 13	37 . 17 . 5	14 . 9 . 13
3 . 13 . 17	5 . 9 . 15	44 . 19 . 18	96 . 6 . 16
5 . 8 . 21	7 . 5 . 17	59 . 6 . 16	31 . 9 . 19
9 . 16 . 6	6 . 11 . 13	36 . 13 . 23	94 . 5 . 17

APOTHECARIES' WEIGHT.

dr. sc. gr.	oz. dr. sc.	lb. oz. dr.	dr. sc. gr.
3 . 1 . 17	11 . 7 . 2	14 . 3 . 7	6 . 1 . 17
5 . 0 . 19	3 . 5 . 1	17 . 7 . 2	4 . 0 . 16
7 . 2 . 15	9 . 6 . 0	19 . 5 . 5	2 . 2 . 17
3 . 2 . 12	13 . 3 . 2	31 . 4 . 6	5 . 2 . 13
5 . 0 . 14	7 . 5 . 2	71 . 7 . 6	6 . 0 . 15
6 . 1 . 16	10 . 7 . 1	54 . 6 . 4	2 . 2 . 19

ADDITION OF MEASURES.

AVOIRDUPOIS WEIGHT.

lb.	oz.	dr.	cwt.	qr.	lb.	t.	cwt.	qr.	cwt.	qr.	lb.
7	12	13	31	2	19	7	17	2	31	1	8
9	13	9	71	3	13	8	19	1	79	0	17
6	8	15	59	1	19	5	15	3	14	3	13
8	11	12	64	3	15	7	16	3	67	2	25
3	9	8	71	2	16	6	7	2	35	0	19
8	13	15	39	2	18	8	13	1	19	3	27

LONG MEASURE.

f.	in.	b.c.	yd.	f.	in.	m.	fur.	po.	leag.	m.	f.
31	8	2	17	1	7	27	7	18	27	2	4
9	7	1	39	2	6	8	3	19	39	0	5
12	3	2	54	2	5	37	5	17	54	1	6
47	11	0	67	0	9	19	7	31	86	2	3
9	9	1	86	1	6	54	6	27	71	2	3
36	5	2	54	2	5	37	2	8	9	1	7

LAND MEASURE.

a.	r.	p.	a.	r.	p.	a.	r.	p.	a.	r.	p.
33	1	19	85	1	19	37	3	16	43	3	16
28	3	36	96	3	21	59	1	17	61	2	17
56	2	27	27	3	38	51	3	16	37	3	29
8	3	31	41	2	19	69	2	29	51	1	37
7	1	38	38	3	36	27	3	16	27	3	16
19	3	26	49	1	19	35	3	17	32	2	37

CLOTH MEASURE.

yd.	qr.	n.	yd.	qr.	n.	yd.	qr.	n.	yd.	qr.	n.
31	2	1	31	3	1	87	2	3	67	1	2
71	3	3	5	2	3	31	1	2	19	2	3
58	0	3	74	3	2	81	0	3	37	2	0
37	3	2	9	3	2	37	2	1	41	1	3
41	2	1	79	0	3	8	1	3	3	0	2
64	1	3	86	2	3	54	2	0	74	3	1

DRY MEASURE.

qr.	bu.	p.	qr.	bu.	p.	qr.	bu.	p.	ch.	bu.	p.
27	5	2	38	3	3	39	6	2	39	19	2
34	6	3	21	5	1	27	2	1	74	21	1
86	7	0	9	6	3	43	1	3	36	28	2
27	4	3	36	5	2	37	2	0	37	12	1
41	6	2	54	4	2	6	5	3	47	34	3
96	5	2	8	7	3	39	7	2	39	16	3

A hop-merchant buys 5 bags of hops, of which the first weighed 2 cwt. 3 qrs. 13 lb; the second 2 cwt. 2 qrs. 11 lb.; the third 2 cwt. 3 qrs. 5 lb.; the fourth 2 cwt. 3 qrs. 12 lb; the fifth 2 cwt. 3 qrs. 15 lb. He purchased besides, two pockets, each weighing 84 lb. I desire to know the weight of the whole?   *Ans.* 15 cwt. 2 qrs.

COMPOUND ADDITION.

WINE MEASURE.

run.	g.	qts.	tier.	g.	p.	hhd.	g.	p.	t.	hhd.	g.
37	7	3	21	17	6	22	17	5	3	3	37
71	9	2	26	35	7	31	31	4	7	2	35
27	12	3	54	18	2	6	27	6	5	1	17
91	6	0	71	36	0	29	46	2	9	3	21
37	13	3	37	22	5	9	21	3	5	3	36
47	14	2	14	8	7	36	36	2	7	2	14

ALE AND BEER MEASURE.

bar.	fir.	g.	bar.	fir.	g.	hhd.	g.	qts.	hhd.	g.	pts.
31	1	6	36	3	3	26	17	2	19	16	6
27	0	6	35	2	5	48	16	3	21	16	5
19	3	5	49	3	8	27	34	2	36	19	4
25	1	5	57	0	6	35	19	3	74	14	6
43	2	6	86	2	2	45	16	3	53	17	2
37	3	7	7	3	5	67	13	2	69	16	7

Time.

h. m. sec.	d. h. m.	d. h. m.	yrs. d. h.
7 . 27 . 19	27 . 17 . 57	21 . 16 . 27	31 . 27 . 12
9 . 36 . 37	10 . 10 . 26	36 . 15 . 24	74 . 69 . 19
12 . 17 . 38	18 . 16 . 21	19 . 13 . 57	38 . 123 . 15
17 . 48 . 21	31 . 15 . 39	25 . 16 . 19	97 . 171 . 22
10 . 37 . 6	74 . 9 . 28	37 . 12 . 31	27 . 59 . 16
16 . 12 . 17	45 . 18 . 16	41 . 16 . 37	56 . 316 . 23

A man was born in the year 1797; when will he be 57 years old?   *Ans.* 1854.

A father was 24 years of age (allowing 13 months to a year, and 28 days to a month) when his first child was born; between the eldest and next born was 1 year, 11 months, 14 days; between the second and third were 2 years, 1 month, and 15 days; between the third and fourth were 2 years, 10 months, and 25 days: when the fourth was 27 years, 9 months, and 12 days old, how old was the father?   *Ans.* 58 years, 7 months, 10 days.

A nobleman had a service of plate, which consisted of twenty dishes, weighing 203 oz. 8 dwts.; 36 plates, weighing 408 oz. 9 dwts.; 5 dozen of spoons, weighing 112 oz. 8 dwts.; 6 salts, and 6 pepper-boxes, weighing 71 oz. 7 dwts.; knives and forks, weighing 73 oz. 5 dwts.; two large cups, a tankard, and a mug, weighing 121 oz. 4 dwts.; a tea-kettle and lamp, weighing 131 oz. 7 dwts.; together with sundry other small articles, weighing 105 oz. 5 dwts. I desire to know the weight of the whole?   *Ans.* 102 lb. 2 oz. 13 dwts.

A, of Vienna, owes to B of Liverpool, for goods received in January, the sum of £103. 12s. 2d.; in February £93. 3s. 4d.; March £121. 17s.; April £142. 15s. 4d.; May £171. 15s. 10d.; June £142. 12s. 6d.; but the latter six months of the year, owing to the falling off in the demands for the articles in which he dealt, amounted only to £205. 7s. 2d. I desire to know the amount of the whole year's bill?   *Ans.* 981. 3s. 4d.

SUBTRACTION

of

Money, Weights, and Measures.

UBTRACTION of several denominations, or Compound Subtraction, shows how to find the difference between any two numbers of different kinds, and to perform which observe the following

RULE.—Place the lesser number before the greater, so that the parts of the same denomination may stand directly under each other, and draw a line below them. Begin at the right hand, and subtract each number or part in the lower line from the one just above it, and set the remainder straight below it; but if any number in the lower line be greater than that above it, add as many to

G

the upper number as make one of the next higher denomination; then take the lower number from the upper one thus increased, & put down the difference.

PUTTING DOWN A DIFFERENCE.

Carry the 1 borrowed to the next number in the lower line, and subtract this number from the one above it, as before, and so proceed till the whole is finished. The several remainders, taken together, will then form the whole difference sought.

PROOF.—The method of proof is the same as in Simple Subtraction.

EXAMPLES IN MONEY.

Borrowed ...£715 . 2 . 7¼
Paid .... 476 . 3 . 8½

Remains to pay £238 . 18 . 10¾

Proof...715 . 2 . 7¼

Lent ....£316 . 3 . 5½
Received ..... 218 . 2 . 1¼

To receive......£98 . 1 . 3¾

£321 . 17 . 1¼	£59 . 15 . 3¼	£527 . 3 . 5¼
257 . 14 . 7	36 . 17 . 2	139 . 5 . 7½

Borrowed £25107 . 15 . 7   Lent ...£250156 . 1 . 6

Paid at different times.
$$\left\{\begin{array}{l} 375 . \ 5 . 5\frac{1}{4} \\ 259 . \ 2 . 7\frac{1}{2} \\ 359 . 13 . 4\frac{3}{4} \\ 523 . 17 . 3 \\ 274 . 15 . 7\frac{1}{4} \\ 325 . 13 . 5 \end{array}\right.$$

Received at several payments.
$$\left\{\begin{array}{l} 271 . 13 . 7\frac{1}{4} \\ 359 . 15 . 3 \\ 475 . 13 . 9\frac{3}{4} \\ 527 . 15 . 3\frac{1}{4} \\ 272 . 16 . 5 \\ 150 . \ 0 . 0 \end{array}\right.$$

Paid in all...£

Remains to pay

Rec. in all... £

Still to rec...£

REMAINS TO PAY.

TROY WEIGHT.

	lb. oz. dwt.	*lb. oz. dwt. gr.*	*oz. dwt. gr.*
Bought	52 . 1 . 7	76 . 2 . 2 . 7	123 . 12 . 18
Sold	39 . 0 . 15	67 . 7 . 1 . 5	34 . 15 . 21
Unsold			

AVOIRDUPOIS WEIGHT.

	lb. oz. dr.	*cwt. qrs. lb.*	*tons cwt. qrs.*
From	67 . 10 . 5	135 . 1 . 21	321 . 10 . 2
Sub.	29 . 15 . 7	45 . 3 . 27	179 . 15 . 3

CLOTH MEASURE.

	F.e. qrs. n.	*yds. qrs. n.*	*E.e. qrs. n.*
From	135 . 2 . 2	171 . 1 . 2	150 . 2 . 1
Sub.	67 . 2 . 3	103 . 2 . 1	89 . 3 . 2

LONG MEASURE.

	yds. ft. in.	*mil. fur. po.*	*leag. mi. fur.*
From	107 . 1 . 10	670 . 3 . 25	147 . 2 . 5
Sub.	78 . 2 . 11	292 . 5 . 32	58 . 2 . 7

LAND MEASURE.

	acres ro. per.	*acres ro. per.*	*acres ro. per.*
From	175 . 1 . 17	145 . 2 . 19	325 . 2 . 19
Sub.	59 . 0 . 27	56 . 0 . 27	179 . 3 . 25

SUBTRACTION OF TIME.

	yrs. mo. we. da.	*yrs. da. ho.*	*ho. min. sec.*
From	173 . 8 . 2 . 4	1826 . 73 . 18	134 . 42 . 45
Sub.	96 . 9 . 3 . 5	937 . 219 . 21	49 . 53 . 47

WINE MEASURE.

	hhd. gal. qts.	*pipes hhd. gal.*	*tun. hhd. gal.*
From	97 . 47 . 2	165 . 1 . 49	42 . 2 . 37
Sub.	78 . 59 . 3	76 . 0 . 61	17 . 3 . 49

ALE OR BEER MEASURE.

	gal. qt. pt.	*bar. fir. gal.*	*hhd. gal. qts.*
From	210 . 1 . 0	137 . 2 . 1	127 . 27 . 1
Sub.	109 . 3 . 1	28 . 1 . 7	72 . 50 . 2

DRY MEASURE.

	qrs.	bus.	p.		qrs.	bus.	p.		last.	qr.	bus.
From	172	. 1	. 2		165	. 0	. 1		120	. 3	. 3
Sub.	85	. 2	. 3		82	. 2	. 3		94	. 9	. 5

THE APPLICATION.

What is the difference between the age of a person born in 1745, and another born in 1801 ?   *Ans.* 56.

When an estate of £300 per annum is reduced, on payment of taxes, to 12 score and £14. 6s., what is the tax ?   *Ans.* £45. 14s.

What is the difference between £9154, and the amount of £754, added to £305 ?   *Ans.* £8095.

A merchant, at his outsetting in trade, owed £750; he had in cash, commodities, the stocks, and in good debts £12,510. 7s.; he cleared the first year by commerce, £452. 3s. 6d. : what is the net balance at the 12 months' end ?   *Ans.* 12,212. 10s. 6d.

From a piece of silk which measured 68 yds. 3 qrs., the following quantities have been sold, viz. 10 yds. 3 qr.; 14 yds. 2 qr. 2 n.; 17 yds. 3 qr.; 16 yds. 1 qr. 3 n.; and 5 yds. 3 qr. ;—how much remains unsold ?
                    Ans. 3 yds. 1 qr. 3 n.

My correspondent at Seville, in Spain, sends me the following account of money received at different sales for goods sent him by me, viz.—bees-wax to the value of £37. 15s. 4d.; stockings £37. 6s. 7d.; tobacco £125. 11s. 6d.; linen cloth £112. 14s. 8d.; tin £115. 10s. 5d. My correspondent at the same time informs me, that he has shipped, agreeable to my order, wines to the value of £250. 15s.; fruit to the value of £51. 12s. 6d.; figs £19. 17s. 6d.; oil £19. 12s. 4d.; and Spanish wool to the value of £115. 15s. 6d. I desire to know how the account stands between us, and who is the debtor ?
    Ans. Due to my Spanish correspondent £28. 14s. 4d.

A horse in his furniture is worth £37. 5s.; out of it 14 guineas: how much does the price of the furniture exceed that of the horse?   *Ans.* £7. 17s.

A tradesman happening to fail in business, called all his creditors together, and found he owed A £53. 7s. 6d.; to B £105. 10s.; to C £34. 5s. 2d.; to D £28. 16s. 5d.; to E £14. 15s. 8d.; to F £112. 9s.; and to G £143. 12s. 9d. His creditors found the value of his stock to be £212. 6s. and that he had owing to him in good book debts £112. 8s. 3d.; besides £21. 10s. 5d., money in hand. As his creditors took all his effects into their hands, I desire to know whether they were losers or gainers, and how much? *Ans.* The creditors lost £146. 11s. 10d.

A FIGURE IN SUBTRACTION,
WHERE THERE IS A GOOD DEAL TAKEN AWAY.

MULTIPLICATION

Of Several Denominations.

M ULTIPLICATION of Money, and of Weights, Time, or Measure, teaches to find the value of any simple quantity, when the integer has a given price; and shows the amount of any number of several denominations repeated a proposed number of times; and is performed by the following

RULE.

Set the multiplier under the lowest denomination of the multiplicand, and draw a line below it. Mul-

tiply the first denomination by the quantity given,

DIVIDING THE PRODUCT

by as many of that as make one of the next, and

SETTING DOWN THE REMAINDER.

Carry the quotient to the next superior, and proceed
in like manner to the highest denomination proposed :

so shall the last product, with the several remainders, taken together as one compound number, give the amount required.

If the given quantity should exceed 12, multiply by any two numbers, which, multiplied together, will make the same number; but if no two numbers multiplied together will make the exact amount, then multiply the top line by as many as may be wanting, adding to it the last product.

PROOF.—The same as Multiplication of Integers.

EXAMPLES.

£35 . 12 . 7¼	£62 . 5 . 4¼	£57 . 2 . 4¾
2	4	5
£71 . 5 . 2½		

18 yds. of cloth, at 9 . 6	26 lbs. of tea, at £1 . 2 . 6
per yard 9	per lb. 8
9 × 2 = 18 4 . 5 . 6	8 × 3 + 2 = 26 9 . 0 . 0
2	3
Ans. £8 . 11 . 0	27 . 0 . 0
	Top line × 2 2 . 5 . 0
	Ans. £29 . 5 . 0

21 ells of holland, at 7s. 8½d.   *Ans....* £8 .   1 . 10½
35 firkins of butter, at 15s. 3½d. .... 26 . 15 .   2½
75 lb. of nutmegs, at 7s. 2¾d. .... 27 .   2 .   2¼
97 cwt. of cheese, at 25s. 3d. ....122 .   9 .   3
43 dozen of candles, at 6s. 4d............... 13 . 12 .   4
127 lb. of bohea, at 12s. 3d. .... 77 . 15 .   9
135 gallons of rum, at 7s. 5d. .... 50 .   1 .   3

A DOMESTIC RULE.

RULE 2.—When the given quantity consists of $\frac{1}{2}$, or $\frac{1}{4}$, divide the price by 2, or 4; when $\frac{3}{4}$, divide by 2, and that quotient by 2, which add to the previous product.

25$\frac{1}{2}$ ells of holland, at 3s. 4$\frac{1}{2}$d. per ell.

$$\begin{array}{r} 5 \\ \hline 0 \ . \ 16 \ . \ 10\frac{1}{2} \\ 5 \end{array} \qquad 5 \times 5 = 25$$

$$\begin{array}{l} 4 \ . \ \ 4 \ . \ \ 4\frac{1}{2} = \text{price of 25 yards.} \\ 0 \ . \ \ 1 \ . \ \ 8\frac{1}{4} = \text{price of } \frac{1}{2} \text{ yard.} \end{array}$$

Ans. £4 . 6 . 0$\frac{3}{4}$ = price of 25$\frac{1}{2}$ yards.

75½ ells of diaper, at 1s. 3d.   *Ans*.... £4 . 14 . 4½
19½ ells of damask, at 4s. 3d. ....   4 . 2 . 10½
35¼ ells of dowlas, at 1s. 4d. ....   2 . 7 . 0
7¼ cwt. of Malaga raisins, at 21s. 6d.......   7 . 15 . 10½
6½ barrels of herrings, at 75s. 7d. .... 24 . 11 . 3½
35½ cwt. double-refined sugar, at 95s. 6d. 169 . 10 . 3
154½ cwt. of tobacco, at 97s. 10d. ....755 . 15 . 3
117¼ gallons of arrack, at 12s. 6d.......... 73 . 5 . 7½
85¾ cwt. of cheese, at 27s. 8d................118 . 12 . 5
29¼ lb. of fine hyson tea, at 22s. 9d. ...... 33 . 5 . 5¼
17¾ yards of superfine scarlet, at 23s. 6d... 20 . 17 . 1½
37½ yards of brocaded silk, at 12s. 4d. ... 23 . 2 . 6
56¾ cwt. of sugar, at 58s. 7d. ....166 . 4 . 7¼
96½ cwt. of currants, at 55s. 6d. ....267 . 15 . 9
45¾ lb. of Belladine silk, at 18s. 6d......... 42 . 6 . 4½

ORDINARY MULTIPLICATION.

87¾ bushels of wheat, at 4s. 3d.   *Ans....*£ 18 . 12 . 11¼
120¾ cwt. of hops, at 87s. 6d..................528 . 5 . 7½
407 yards of cloth, at 3s. 9½d................ 77 . 3 . 2½
729 ells of cloth, at 7s. 7¼d. ....277 . 3 . 5¼
2068 yards of lace, at 9s. 5½d. ....977 . 19 . 10

THE APPLICATION.

What sum of money must be divided amongst 18 men, so that each man may receive £14. 6s. 8½d. ?

Ans. £258. 0s. 9d.

A privateer of 250 men took a prize, which amounted to £125. 15s. 6d. for each man: what was the value of the prize ?   *Ans.* £31,443. 15s.

EXTRAORDINARY MULTIPLICATION.

H

What is the difference between six dozen dozen and half a dozen dozen: and what is their sum and product?
Ans. 792 diff. 936 sum, 62208 product.

What difference is there between twice eight and fifty, and twice fifty-eight, and what is their product?
Ans. 50 diff. 7656 product.

There are two numbers, the greater of them is 37 times 45, and their difference 19 times 4. Required their sum and product?   *Ans.* 3254 sum, 2645685 product.

If a person has 10s. 7¾d. per day, how much is that per annum?   *Ans.* £194. 5s. 8¾d.

The sum of two numbers is 360, the less of them 144; what is their product, and the square of their difference?
Ans. 31104 product, 5184 square of diff.

In an army consisting of 187 squadrons of horse, each 157 men, 207 battalions, each 560 men, how many effective soldiers, supposing that in seven hospitals there are 473 sick?   *Ans.* 144806.

What sum did that gentleman receive in dowry with his wife, whose fortune was her wedding suit: her petticoat having two rows of furbelows, each furbelow 87 quills, and in each quill 21 guineas?   *Ans.* £3836. 14s.

A merchant had £19118 to begin trade with: for 5 years together he cleared £1086 a year; the next 4 years he made good £2715. 10s. 6d. a year; but the last 3 years he was in trade, had the misfortune to lose, one year with another, £475. 4s. 6d. a year: what was he worth at 12 years' end?   *Ans.* £33984. 8s. 6d.

Having purchased the following foreign coins, viz. 75 pistoles at 17s. 6d. each, 48 dollars at 4s. 6d. each, and 127 ducats at 3s. 4d. each, for which I presented a draft for 300 guineas, what change am I to receive?
Ans. £217. 8s. 2d.

Went to market with £5, and bought 8 lb. of mutton at 9½d. per lb., 37 lb. of beef at 7½d. per lb., a quarter of lamb for 13s. 9d., veal 13 lb. at 1s. 4½d. per lb., spent in vegetables 2s. 9½d., and in fruit 4s. 7d.; what change ought I to have remaining?   *Ans.* £1. 11s. 6½d.
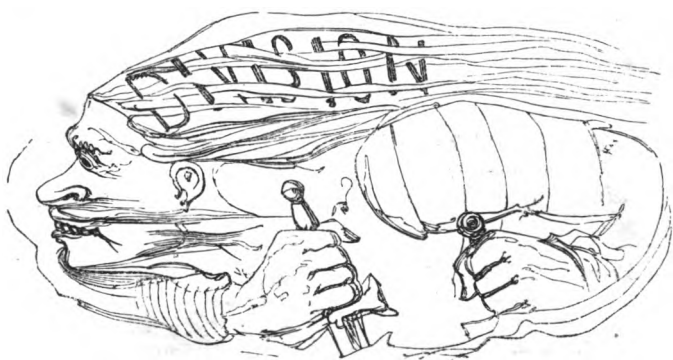
COMPOUND

IVISION teaches to divide any sum of several denominations by a given quantity, or into a stipulated number of equal parts, in manner following:

Divide the number of the highest denomination stated by the divisor, and set down the quotient; if there be any remainder, reduce it to the next lower denomination, add to it the number pertaining, and divide as before. Set down also this quotient, reduce its remainder in like manner, and so proceed through all the denominations stated.

EXAMPLES.

	£.	s.	d.
Divide 2)571	11	7¾ by 2	

Ans.   285 15 9¾ −1
                    2

Proof   571 11 7¾

	£.	s.	d.
3) 825	15	8¾ by 15	

5)275   5   2¾ −2
Ans. 55 1 0⅓ −1 } = 1¼d.
                   5   *over.*

275   5   2¾
            3

£825 15 8¾ *Proof.*

	lb.	oz.	dwt.	gr.
2)14	7	17	10	
	7	3	18	17

	cwt.	qr.	lb.	oz.	dr.
3)371	1	19	6	8	
	123	3	6	7	8

	£.	s.	d.
Divide 315	. 16	. 5½ by 17.	

17)315 16 5½ (18 11 6½ = 1.
      17   4

      145   74   6   2
      136   4

        9   297   4   8
       20   18 11 6½
                              3
17)196 (11
      17   £315 16 5½ *Proof.*

      26
      17

       9
      12

17)113 (6
      102

       11
        4

17)46 (½
      34

       12 = 3d.

Divide £1407. 17s. 6d. by 12, 13, 39, and 78.
         £70,079. 13s. 4d. by 56, 112, 144, and 168.
         £490,981. 18s. 9d. by 219, 292, 365, and 1728.
         £19,743,052. 5s. 7½d. by 810, 1260, and 7300.

Divide 83 lbs. 5 oz. 10 dwts. 17 gr. by 8.

29 tons, 17 cwt. 0 qr. 18 lb. by 9.

114 yards, 3 qrs. 2 nails, by 10.

1017 miles, 6 furlongs, 38 poles, by 11.

296 qrs., 17 bushels, and 2 pecks, by 45.

2019 acres, 3 roods, 29 poles, by 26.

117 years, 7 months, 3 weeks, 5 days, 11 hours, 27 minutes, by 37, and 74.

DIVIDING 2 BY 1.

If a man spends £257. 2s. 3d. in 12 months' time, what is that per month? *Ans.* £21. 8s. 6¼d.

The clothing of 35 charity boys came to £57. 3s. 7d., what is the expense of each? *Ans.* £1. 12s. 8d.

If 20 cwt. of tobacco come to £27. 5s. 10d., at what rate is that per cwt.? *Ans.* £1. 7s. 3½d.

What is the value of 1 hogshead of beer, when 120 are sold for £154. 17s. 6d.? *Ans.* £1. 5s. 9¾d.

Bought 72 yards of cloth for £85. 5s. 6d.; I desire to know at what rate per yard? *Ans.* £1. 3s. 8¼d.

A prize of £7257. 3s. 6d. is to be equally divided amongst 500 sailors; what is each man's share?
Ans. £14. 10s. 3¼d.

A club in London, consisting of 25 gentlemen, joined for a lottery ticket of £10 value, which came up a prize of £4000. I desire to know what each man contributed, and what each man's share came to?
　　　　　Ans. Each contributed 8s. ; each share £160.

A trader cleared £1156 equally in 17 years; how much did he lay by in a year?　　　　　*Ans.* £68.

What number added to the 43rd part of £4429 will raise it to £240?　　　　　*Ans.* £137.

Divide 20s. between A, B, and C, in such sort that A may have 2s. less than B, and C 2s. more than B.
　　　　　Ans. A 4s. 8d., B 6s. 8d., C 8s. 8d.

If there are 1000 men to a regiment, and but 50 officers, how many private men are there to one officer?
　　　　　Ans. 19.

What number is that which multiplied by 7847, will make the product 3013248?　　　　　*Ans.* 384.

The quotient is 1083, the divisor 28604; what was the dividend, the remainder being 1788?　　*Ans.* 30979920.
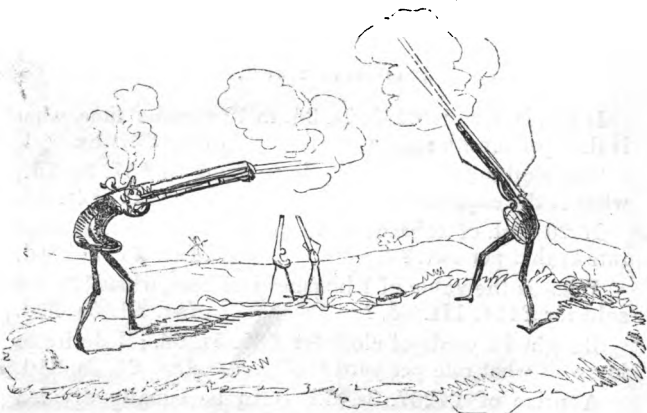
GENTLEMANLY DIVISION.

An army, consisting of 20,000 men, took and plundered a city of £12,000. What was each man's share, the whole being equally divided among them? *Ans.* 12s.

My purse and money, said Dick to Harry, are worth 12s. 8d., but the money is worth seven times the purse; what did the purse contain? *Ans.* 11s. 1d.

A merchant bought two lots of tobacco, which weighed 12 cwt. 3 qrs. 15 lb., for £114. 15s. 6d. Their difference in point of weight was 1 cwt. 2 qrs. 13 lb., and of price £7. 15s. 6d.; I desire to know their respective weights and value?

Ans. Lesser weight 5 cwt. 2 qrs. 15 lb. Price £53. 10s.
Greater weight 7 cwt. 1 qr. Price £61. 5s. 6d.

Divide 1000 crowns in such a manner between A, B, and C, that A may receive 129 more than B, and B 178 less than C. *Ans.* A 360, B 231, C 409.

BILLINGSGATE DIVISION.

BILLS OF PARCELS.

HOSIER'S.

Mr. John Thomas,

Bought of Samuel Green.

March 7, 1841.	*s.*	*d.*	£.	*s.*	*d.*
8 pair of worsted stockings...at	4	6	per pair.		
5 pair of thread ditto ....at	3	2	,,		
3 pair of black silk ditto......at	14	0	,,		
6 pair of milled hose ....at	4	2	,,		
4 pair of cotton ditto ....at	7	6	,,		
2 yards of fine flannel ....at	1	8	per yard.		

£7 . 12 . 2

MERCER'S.

Mr. Isaac Grant,

Bought of John Simms.

April 12, 1841.	*s.*	*d.*	£.	*s.*	*d.*
15 yards of satin ....at	9	6	per yard.		
18 yards of flowered silk......at	17	4	,,		
12 yards of rich brocade......at	19	8	,,		
16 yards of sarsenet............at	3	2	,,		
13 yards of Genoa velvet ...at	27	6	,,		
23 yards of lutestring ....at	6	3	,,		

£62 . 2 . 5

LINEN-DRAPER'S.

Mr. Simon Surety,

Bought of Josiah Short.

May 27, 1841.	*s.*	*d.*	£.	*s.*	*d.*
4 yards of cambric ....at	12	6	per yard.		
12 yards of muslin ....at	8	3	,,		
15 yards of printed linen ......at	5	4	,,		
2 dozen of napkins ....at	2	3	each.		
14 ells of diaper..................at	1	7	per ell.		
35 ells of dowlas ....at	1	1½	,,		

£17 . 4 . 6½

MILLINER'S.

Mrs. Bright,

Bought of Lucy Brown.

June 5, 1841.		s.	d.	£.	s.	d.
18	yards of fine lace............at	12	3 per yard.			
5	pair fine kid gloves.........at	2	2 per pair.			
4	dozen of Irish lamb ditto at	1	3 ,,			
12	fans of French mounts ...at	3	6 each.			
2	fine laced tippets............at	63	0 ,,			
6	sets of knots ....at	2	6 per set.			

£23 . 14 . 4

WOOLLEN-DRAPER'S.

Mr. Thomas Sage,

Bought of Ellis Smith.

June 17, 1841.		s.	d.	£.	s.	d.
17	yards of fine serge ....at	3	9 per yard.			
18	yards of drugget............at	9	0 ,,			
16	yards of black cloth ......at	18	0 ,,			
15	yards of superfine scarlet..at	22	0 ,,			
25	yards of shalloon ....at	1	9 ,,			
17	yards of drab cloth.........at	17	6 ,,			

£59 . 5 . 0

LEATHER-SELLER'S.

Mr. Giles Harris,

Bought of Abel Smith.

August 15, 1841.		s.	d.	£.	s.	d.
27	calf skins ....at	3	9 each.			
75	sheep ditto.................at	1	7 ,,			
36	coloured ditto ....at	1	8 ,,			
15	buck ditto ....at	11	6 ,,			
17	Russia hides ....at	10	7 ,,			
120	lamb skins ....at	1	2½ ,,			

£38 . 17 . 5

GROCER'S.

MR. RICHARD GROVES,

Bought of FRANCIS ELLIOTT.

September 21, 1843.   *s.   d.*   *£.   s.   d.*

25 lb. of lump sugar ....at 0   9½ per lb.

2 loaves of double-refined }
   ditto, weight 15 lb....... } at 0 11½   ,,

14 lb. of rice ....at 0   3   ,,

28 lb. of Valencia raisins ......at 0   5   ,,

15 lb. of currants ....at 0   9½   ,,

7 lb. of black pepper ....at 1 10   ,,
                                              _____

                                      £3 . 14 . 0½

CHEESEMONGER'S.

MR. CHARLES CROSS,

Bought of SAMUEL GRANT.

November 23, 1843.   *s.   d.*   *£.   s.   d.*

8 lb. of Cambridge butter ......at 1   1 per lb.

17 lb. of new cheese...............at 0   8   ,,

½ firkin of butter, wt. 28 lb. ...at 0 10½   ,,

2 Cheshire cheeses, wt. 127 lb. at 0   9   ,,

2 Warwickshire ditto, wt. 15 lb. at 0   7   ,,

12 lb. of cream cheese ....at 0 10   ,,
                                              _____

                                      £7 . 18 . 6

CORN-CHANDLER'S.

MR. ABRAHAM DOYLEY,

Bought of ISAAC JONES.

December 20, 1843.   *s.   d.*   *£.   s.   d.*

Tares, 19 bushels............at 1 10 per bushel.

Peas, 18 bushels ....at 3   9   ,,

Beans, 12 bushels ....at 4   8   ,,

Oats, 6 quarters .... at 2   4   ,,

Malt, 7 quarters ....at 25 0 per quarter.

Hops, 15 lb....................at 1   5   per lb.
                                            _____

                                      £23 . 6 . 7
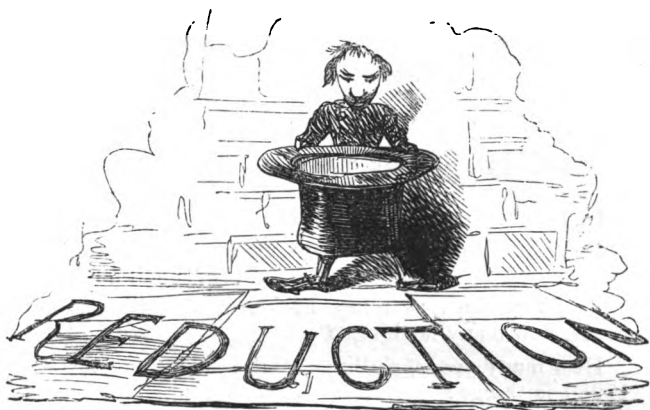
REDUCTION is the bringing or reducing numbers of one denomination into other numbers of another denomination, retaining the same value, and is performed by Multiplication and Division.

First. All great names are brought into small by multiplying with so many of the less as make one of the greater.

Secondly. All small names are brought into great by dividing with so many of the less as make one of the greater.

In £8 how many shillings and pence?

20	*Proof.*
—	12) 1920 pence.
160 shillings. *Ans.*	—
12	20) 160 shillings.
—	
1920 pence. *Ans.*	£8.

In £12 how many shillings, pence, and farthings?
Ans. 240s., 2880d., 11520 far.

In 311520 farthings, how many pounds?
<div align="right">*Ans.* £324. 10s.</div>

In £17. 5s. 3¼d., how many farthings?   *Ans.* 16573.

In £25. 14s. 1d., how many shillings and pence?
<div align="right">*Ans.* 514s., 6169d.</div>

In 17940 pence, how many crowns?   *Ans.* 299.

In 57 half-crowns, how many pence and farthings?
<div align="right">*Ans.* 1710d., 6840 farthings.</div>

In 52 crowns, as many half-crowns, shillings, and pence, how many farthings?   *Ans.* 21424.

How many pence, shillings, and pounds, are there in 17280 farthings?   *Ans.* 4320d., 360s., £18.

In 6169 pence, how many shillings and pounds?
<div align="right">*Ans.* 514s., £25. 14s. 1d.</div>

In 21424 farthings, how many crowns, half-crowns, shillings, and pence, and of each an equal number?
<div align="right">*Ans.* 52.</div>

Reduce £102. 12s. into shillings and moidores.
<div align="right">*Ans.* 2052s., 76 moidores.</div>

How many shillings, crowns, and pounds, in sixty guineas?   *Ans.* 1260s., 252 crowns, £63.

If 103 guineas and seven shillings are to be divided amongst seven men, how many pounds sterling is that for each?   *Ans.* £15. 10s.

A certain person had 25 purses, and in each purse 12 guineas, a crown, and a moidore; how many pounds sterling had he in all?   *Ans.* £355.

A gentleman, in his will, leaves £50 to the poor, and ordered that ⅓ should be given to ancient men, each to have 5s.; ¼ to poor women, each to have 2s. 6d.; ⅓ to poor boys, each to have 1s.; ⅓ to poor girls, each to have 9d.; and the remainder to the person who distributed it. I demand how many of each sort there were, and what the person that distributed the money had for his trouble?   *Ans.* 66 men, 100 women, 200 boys, 222 girls, £2. 13s. 6d. to the distributor.

Troy Weight.

In 27 ounces of gold, how many grains? *Ans.* 12960.

In 12960 grains of gold, how many ounces? *Ans.* 27.

In 3 lb. 10 oz. 7 dwt. 5 gr., how many grains?
Ans. 22253.

In 8 ingots of silver, each weighing 7 lb. 4 oz. 17 dwt. 15 grs. how many ounces, pennyweights, and grains?
Ans. 711 oz. 14221 dwt. 341304 gr.

How many ingots of 7 lb. 4 oz. 17 dwt. 15 gr. each, are there in 341304 grains? *Ans.* 8 ingots.

Bought 7 ingots of silver, each containing 23 lb. 5 oz. 7 dwt.; how many grains? *Ans.* 945336.

A gentleman sent a tankard to his goldsmith, that weighed 50 oz. 8 dwt., and ordered him to make it into spoons, each to weigh 2 oz. 16 dwt.; how many had he?
Ans. 18.

A gentleman delivered to a goldsmith 137 oz. 6 dwt. 9 gr. of silver, and ordered him to make it into tankards of 17 oz. 15 dwt. 10 gr. each; spoons of 21 oz. 11 dwt. 13 gr. per dozen; salts of 3 oz. 10 dwt. each; and forks of 21 oz. 11 dwt. 13 gr. per dozen; and, for every tankard, to have one salt, a dozen of spoons, and a dozen of forks; what is the number of each he must have?
Ans. Two of each sort; and 8 oz. 9 dwt. 9 gr. over.

Avoirdupois Weight.

In 14769 ounces, how many hundred weight?
Ans. 8 cwt. 27 lb. 1 oz.

Reduce 8 cwt. 27 lb. 1 oz. into quarters, pounds, and ounces. *Ans.* 32 qrs. 923 lb. 14769 oz.

Bought 32 bags of hops, each 2 cwt. 1 qr. 14 lb., and another of 150 lb.; how many cwt. in the whole?
Ans. 77 cwt. 1 qr. 10 lb.

In 34 tons, 17 cwt. 1 qr. 19 lbs., how many pounds?
Ans. 78111.

I

In 27 cwt. of raisins, how many parcels of 18 lb. each?
Ans. 168.

In 9 cwt. 2 qrs. 14 lb. of indigo, how many pounds?
Ans. 1078 lb.

How many pounds in 27 hogsheads of tobacco, each weighing net 8¾ cwt.? *Ans.* 26460.

How many parcels of sugar of 16 lb. 2 oz. are there in 16 cwt. 1 qr. 15 lb.? *Ans.* 113 par.; 12 lb. 14 oz. over.

In 4 hhds. of sugar, each weighing net 17 cwt. 11 lb., how many pounds? *Ans.* 7660.

The pressure of air upon a person of moderate size, is said to be about 32,400 lbs.; required how many tons?
Ans. 14 tons, 9 cwt. 1 qr. 4 lb.

APOTHECARIES' WEIGHT.

Reduce 27 lbs. 7 oz. 2 dr. 1 sc. 2 gr. into grains.
Ans. 159022.

In 159022 grains, how many pounds?
Ans. 27 lb. 7 oz. 2 dr. 1 sc. 2 gr.

In 421 pounds, 6 ounces, 3 drachms, 2 scruples, and 9 grains, how many grains? *Ans.* 2428069.

How many pills of 3 grains each may be made from 6 lbs. of calomel? *Ans.* 11520.

What number of scruples are there in a chest of rhubarb, weighing 34 lb. 6 oz.? *Ans.* 9936.

Suppose the physicians of St. George's Hospital prescribe a medical composition of 12 pounds 6 ounces, how many boluses may be made thereout, each weighing 4 scruples; and supposing these boluses were to be equally divided amongst 45 patients, how many must each one have? *Ans.* 900 boluses, 20 each patient.

Apothecaries' Weight.—Physicians use peculiar marks in prescriptions, viz. Əj, is 1 scruple; Əiij ═ 3 scruples; ℨviij ═ 8 drams; ℥xij ═ 12 ozs.; ℔j ═ 1 pound.   Also ℞ means Recipe, or take; *a* or *aa*, or ana, the same quantity; *s. s.* the half quantity; *cong.* or congius, a gallon; *coch.* or cochleare, a spoonful; M, or manipulus, a handful; P, or pugil, as much as can be taken by the thumb and forefinger; *q. s.* a sufficient quantity.

WINE MEASURE.

Bought 5 tuns of Port wine; how many gallons and pints? *Ans.* 1260 gallons, 10080 pints.

In 10080 pints, how many tuns? *Ans.* 5.

In 5896 gallons of Canary, how many pipes and hogsheads, and of each a like number? *Ans.* 31 of each, 37 gallons over.

Out of 15 hogsheads of wine, how many dozen of quart and pint bottles can be filled, so as to have of each sort an equal number? *Ans.* 210.

How many hogsheads of wine will it take to fill 210 dozen quart and as many pint bottles? *Ans.* 15.

In 46 tuns, 3 hogsheads, 45 gallons, 3 quarts, 1 pint, how many pints? *Ans.* 94615.

In 23184 pints of wine, how many hhds.? *Ans.* 46.

A gentleman ordered his butler to bottle off $\frac{2}{3}$ of a pipe of French wine into quarts, and the rest into pints: required how many dozen of each he had? *Ans.* 28 dozen of each.

ALE AND BEER MEASURE.

In 46 barrels of beer, how many pints? *Ans*. 13248.

In 19 barrels of ale, how many gallons and quarts?
                    Ans. 684 gallons, 2736 quarts.

In 72 hhds. of porter, how many barrels? *Ans*. 108.

In 108 barrels of beer, how many hogsheads? *Ans*. 72.

In 6 butts, 1 hogshead, 40 gallons, and 2 quarts of beer, how many hogsheads, barrels, and firkins, and of each an equal number? *Ans*. 7 of each, 198 qts. over.

Out of a quantity of beer a brewer filled 7 hogsheads, 7 barrels, and 7 firkins, with 198 quarts over; how many butts did he brew? *Ans*. 6 butts, 1 hhd. 40 gals. 2 qts.

In 363 barrels of ale, how many hogsheads, gallons, and pints? *Ans*. 242 hhds. 13068 gals. 104514 pts.

LAYING THE DUST.
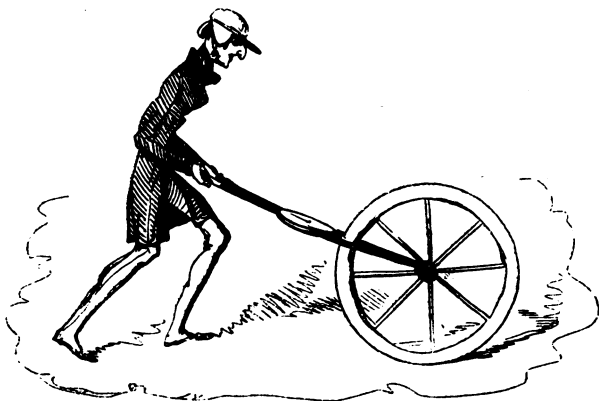
LONG MEASURE.

In 57 miles, how many furlongs and poles?
> *Ans.* 456 furlongs, 18240 poles.

In 7 miles, how many feet, inches, and barley-corns?
> *Ans.* 36960 feet, 443520 in., 1330560 b.-corns.

In 18240 poles, how many furlongs and miles?
> *Ans.* 456 furlongs, 57 miles.

In 72 leagues, how many yards? *Ans.* 380160.

In 380160 yards, how many miles and leagues?
> *Ans.* 216 miles, 72 leagues.

If from London to York be accounted 65 leagues, I demand how many miles, yards, feet, inches, and barley-corns? *Ans.* 195 miles, 343200 yards, 1029600 feet,
> 12355200 inches, 37065600 barley-corns.

How often will the wheel of a coach, that is 17 feet in circumference, turn in 100 miles?
> *Ans.* 31058$\frac{14}{17}$ times round.

How many barley-corns will reach round the world, which is 360 degrees, each degree 69$\frac{1}{2}$ miles?
> *Ans.* 4755801600 barley-corns.

LAND MEASURE.

In 27 acres, how many roods and perches?
                    Ans. 108 roods, 4320 perches.

In 4320 perches, how many acres?   *Ans.* 27.

A person having a piece of ground containing 37 acres,
1 pole, has a mind to dispose of 15 acres to A; I re-
quire how many perches he will have left? *Ans.* 3521.

There are 4 fields to be divided into shares of 75 per-
ches each; the first field contains 5 acres; the second 4
acres, 2 poles; the third 7 acres, 3 roods; and the fourth
2 acres, 1 rood. How many shares are contained therein?
                    Ans. 40 shares, 42 perches over.

SQUARE AND SOLID MEASURE.

In 1 sq. yard, how many sq. inches?   *Ans.* 1296.

How many square yards are there in a street, the length
of which is 864 feet 3 inches, and the breadth 62 feet 6
inches?   *Ans.* 6001 yds. 6 ft. 7 in. 6 p.

In 46656 solid inches, how many solid yards? *Ans.* 1.

How many solid feet are there in a beam, whose breadth
is 18 inches, its depth 15 inches, and its length 16 feet 3
inches?   *Ans.* 30 ft. 5 in. 7 parts, 6 fr.

TIME.

In 72015 hours, how many weeks?
                    Ans. 428 weeks, 4 days, 15 hours.

How many days is it since the birth of our Saviour, to
Christmas 1825?   *Ans.* 666581¼.

Stowe writes, London was built 1108 years before our
Saviour's birth; how many hours is it since to Christmas
1825.   *Ans.* 25710678.

From November 17th, 1824, to September 12th, 1825,
how many days?   *Ans.* 299.

From July 18th, 1799, to April 18th, 1826, how many
years and days? *Ans.* 26 yrs. 9770½ days, reckoning 365
days, 6 hrs. a year; or 26 yrs. 9 mo. 3 wks. 1 day, 6 hrs.

CLOTH MEASURE.

In 27 yards, how many nails? *Ans.* 432.

In 24 pieces, each containing 32 Flemish ells, how many English ells? *Ans.* 460 ells, 4 qrs.

In 17 pieces of cloth, each 27 Flemish ells, how many yards? *Ans.* 344 yards, 1 qr.

Bought 27 pieces of English stuffs, each 27 ells, how many yards? *Ans.* 911 yards, 1 qr.

In 911¼ yards, how many English ells? *Ans.* 729.

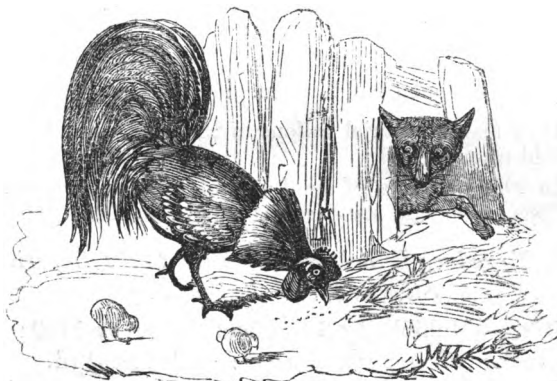In 12 bales of cloth, each 25 pieces, each 15 English ells, how many yards? *Ans.* 5625.

DRY MEASURE.

In 120 quarters of wheat, how many bushels, pecks, gallons, and quarts?
Ans. 960 bush. 3840 pecks, 7680 gals. 30720 qts.

In 30720 quarts of corn, how many quarters? *Ans.* 120.

In 20 chal. of coals, how many pecks? *Ans.* 2880.

In 273 lasts of corn, how many pecks? *Ans.* 87360.

THE LAST PECK.

Rules and Examples

FOR COMPARING

OLD MEASURES WITH IMPERIAL STANDARDS.

1. *To reduce the old Wine or Spirit Measure to the Imperial Gallon, and the contrary.*

RULE.—Multiply by 924, and divide by 1109; the quotient gives the Imperial gallons: or deduct ⅙th.

Multiply by 1109, and divide by 924; the quotient gives the wine gallons Old measure: or add ¼th.

How many Imperial gallons in a pipe of wine, old measure?   *Ans.* 105 gallons.

In a cask of spirits containing 110 gallons measured by the Imperial gallon, how many of the Old measure?   *Ans.* 132 galls.

2. *To reduce the old Ale or Beer Gallon to the Imperial, and the contrary.*

RULE.—Multiply by 1128, and divide by 1109; the quotient gives the New gallons: or add $\frac{1}{60}$th.

Multiply by 1109, and divide by 1128; the quotient gives the gallons of Old measure: or deduct $\frac{1}{59}$th.

How many Imperial gallons in 20 hogsheads of porter of Old measure?   *Ans.* 1098½ gallons.

In 1098½ gallons of ale Imperial measure, how many gallons of the Old standard?   *Ans.* 1080 gallons.

3. *To reduce Winchester Measure to the Imperial Standard, and the contrary.*

RULE.—Multiply by 1075, and divide by 1109; the quotient gives Imperial measure: or deduct $\frac{1}{33}$rd.

Multiply by 1109, and divide by 1075; the quotient

gives the old Winchester standard measure: or add $\frac{1}{32}$nd.
part, or a peck to the quarter.

How many Winchester bushels are in 1280 Imperial
bushels ?   *Ans.* 1320 bushels.

How many quarters of barley of New measure, are
equal to 2160 bushels Winchester measure?
                           Ans. 261 qrs. 5¾ bushels.

Reduce 1320 Winchester bushels into Imperial bush-
els standard measure.   *Ans.* 1280 bushels.

REDUCED TO A CERTAINTY.

CERTAINLY VERY MUCH REDUCED.

P Cruik se

REDUCED IN THE EXTREME.

THE

Single Rule of Three Direct.

—◆—

T is called the RULE OF THREE, because three terms or numbers are given, to find a fourth : and, from its great and extensive utility claims so decided a preference to all others, that it is often denominated the Golden Rule. This rule is usually considered of two kinds, viz. Direct and Inverse. The Rule of Three Direct is that in which more requires more, or less requires less; and enables us to find a fourth, proportional to three numbers given : of these, two contain the supposition, and the third a demand. The Rule of Three Inverse is when more requires less, or less requires more.

RULE.—First state the question; that is, place the numbers in such order, that the first and third be of one kind, and the second the same as the number required : then bring the first and third numbers into one name, and the second into the lowest term mentioned. Multiply the second and third numbers together, and divide the product by the first; the quotient will be the answer to the question in the same denomination you left the second number in.

EXAMPLES.

If 1 lb. of sugar cost 4½d., what cost 54 lb. ?

<p style="text-align:right"><i>Ans.</i> £1. 0s. 3d.</p>

lb.	d.	lb.				
1 :	4½ ::	54	or	1 :	4½ ::	54
	4	18				4½

18   4)972   216
                                        27
       12)243

       <i>Ans.</i> 20/3   12)243

                            <i>Ans.</i> 20/3

If a gallon of beer cost 10d., what is that per barrel ?
<p style="text-align:right"><i>Ans.</i> £1. 10s.</p>

If a pair of shoes cost 4s. 6d., what will 12 dozen come to ?
<p style="text-align:right"><i>Ans.</i> £32. 8s.</p>

If 1 yard of cloth cost 15s. 6d., what will 32 yards cost at the same rate ?
<p style="text-align:right"><i>Ans.</i> £24. 16s.</p>

If 32 yards of cloth cost £24. 16s., what is the value of a yard ?
<p style="text-align:right"><i>Ans.</i> 15s. 6d.</p>

If I give £4. 18s. for 1 cwt. of sugar, at what rate did I buy it per lb. ?
<p style="text-align:right"><i>Ans.</i> 10½d.</p>

If I buy 20 pieces of cloth, each 20 ells, for 12s. 6d. per ell, what is the value of the whole ?
<p style="text-align:right"><i>Ans.</i> £250.</p>

What will 25 cwt. 3 qrs. 14 lb. of tobacco come to at 15½d. per lb. ?
<p style="text-align:right"><i>Ans.</i> £187. 3s. 3d.</p>

NOTE.—The greatest difficulty in the Rule of Three, is stating the question ; in performing which, observe that three terms are always given, and one required. Two of these are supposed to agree with each other in some manner, they are therefore called terms of supposition : the other term requires a fourth to be found which agrees with it in the same way ; it is therefore called the term of demand, and must always be placed as the third term, while the second term is always the same kind as that wanted.

The third term is commonly known by words that ask a question, such as—what cost, what will, what is, what did, how much, how many, I demand, I desire to know, &c.

Bought 27¼ yards of muslin, at 6s. 9½d. per yard; what does it amount to ? *Ans.* £9. 5s. 0¾d.—2 rem.

Bought 17 cwt. 1 qr. 14 lbs. of iron, at 3¼d. per lb.; what does it come to ? *Ans.* £26. 7s. 0½d.

If coffee is sold for 5½d. per oz., what must be given for 2 cwt. ? *Ans.* £82. 2s. 8d.

How many yards of cloth may be bought for the sum of £21. 11s. 1½d., when 3½ yards cost £2. 14s. 3d. ? *Ans.* 27 yards, 3 qrs. 1 nail.—84 rem.

If 1 cwt. of Cheshire cheese cost £1. 14s. 8d., what must I give for 3½ lb. ? *Ans.* 1s. 1d.

Bought 1 cwt. 24 lb. 8 oz. of old lead, at 9s. 4d. per cwt.; what does it come to ? *Ans.* 11s. 4½d.

If a gentleman's income is £500 a year, and he spends 19s. 4d. per day, how much does he lay by at the year's end ? *Ans.* £147. 3s. 4d.

If I buy 14 yards of cloth for 10 guineas, how many Flemish ells can I buy for £283. 17s. 6d., at the same rate ? *Ans.* 504 Fl. ells, 2 qrs.

If 504 Flemish ells, 2 qrs. cost £283. 17s. 6d., at what rate must I give for 14 yards ? *Ans.* £10. 10s.

Gave £1. 1s. 8d. for 3 lb. of tea; what must be given for 29 lb. 4 oz. ? *Ans.* £10. 11s. 3d.

If 1 English ell, 2 qrs. cost 4s. 7d., what will 39½ yards cost at the same rate ? *Ans.* £5. 3s. 5¼d. ⁴⁄₇.

If 1 ounce of gold is worth £5. 4s. 2d., what is the worth of one grain ? *Ans.* 2½d.—20 rem.

If 14 yards of broad cloth cost £9. 12s., what is the purchase of 75 yards ? *Ans.* £51. 8s. 6¾d.—6 rem.

If 27 yards of Holland cost £5. 12s. 6d., how many ells English can I buy for £100 ? *Ans.* 384.

If 1 cwt. cost £12. 12s. 6d., what must I give for 14 cwt. 1 qr. 19 lb. ? *Ans.* £182. 0s. 11½d.—8 rem.

Whereas a noble and a mark just 15 yards did buy,
How many ells of the same cloth for £50 had I ?
Ans. 600 ells.

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Bought 7 yards of cloth for 17s. 8d., what must be given for 5 pieces, each containing 27½ yards?
                    Ans. £17. 7s. 0¼d. – 2 rem.

If 7 oz. 11 dwts. of gold be worth £35, what is the value of 14 lb. 9 oz. 12 dwts. 16 gr. at the same rate?
                    Ans. £823. 9s. 3¾d. – 552 rem.

A draper bought 420 yards of broad cloth, at the rate of 14s. 10¾d. per ell English, how much did he pay for the whole?   *Ans.* £250. 5s.

A gentleman bought a wedge of gold, which weighed 14 lb. 3 oz. 8 dwt., for the sum of £514. 4s., at what rate did he pay for it per ounce?   *Ans.* £3.

A grocer bought 4 hogsheads of sugar, each weighing net 6 cwt. 2 qrs. 14 lb., which cost him £2. 8s. 6d., per cwt.; what is the value of the 4 hogsheads?
                    Ans. £64. 5s. 3d.

A draper bought 8 packs of cloth, each containing 4 parcels, 10 pieces each, and each piece 26 yards, at the rate of £4. 16s. for 6 yards; I desire to know what the 8 packs cost him?   *Ans.* £6656.

If 24 pounds of raisins cost 6s. 6d., what will 18 frails cost, each weighing net 3 qrs. 18 lb.? *Ans.* £24. 17s. 3d.

If 1 ounce of silver be worth 5s., what is the price of 14 ingots, each weighing 7 lb. 5 oz. 10 dwt.?
                    Ans. £313. 5s.

What is the price of a pack of wool weighing 2 cwt. 1 qr. 19 lb., at 8s. 6d. per stone?
                    Ans. £8. 4s. 6¼d. – 10 rem.

Bought 59 cwt. 2 qrs. 24 lb. of tobacco, at £2. 17s. 4d. per cwt., what does it come to?
                    Ans. £171. 3s. 7¼d. – 80 rem.

If a pair of stockings cost 10 groats, how many dozen may I buy for £43. 5s.?   *Ans.* 21 doz. 7½ pair.

If I have nobles eighty score,
    And marks just fifty-two,
In part of fourteen hundred pounds,
    What money rests still due?   *Ans.* £832.

Bought 171 tons of lead, at £14 per ton; paid carriage and other incident charges £4. 10s. I require the value of the lead, and what it stands me per lb.?

Ans. £2398. 10s. value, 1½d. per lb. – 432 rem.

Bought 27 dozen, 5 lbs. of candles, after the rate of 1s. 5d. for 3 lbs., what did they cost me?

Ans. £7. 15s. 4¼d. – 1 rem.

If an ounce of fine gold is sold for £3. 10s., what come 7 ingots to, each weighing 3 lb. 7 oz. 14 dwt. 21 gr. at the same price? *Ans.* £1071. 14s. 5¼d.

If my horse costs me 9½d. per day keeping, what will be the charge of 11 horses for a year? *Ans.* £158. 18s. 6½d.

A factor bought 86 pieces of stuff, which cost him £517. 19s. 4d., at 4s. 10d. per yard; I demand how many yards there were, and how many ells English in a piece?

Ans. 2143¼ yards, 14 rem.; and 19 ells,
4 quarters, 2 nails in a piece. – 64 rem.

A gentleman has an annuity of £896. 17s. per annum; I desire to know how much he may spend daily, that at the year's end he may lay up 200 guineas, and give to the poor quarterly 10 moidores? *Ans.* £1. 14s. 8d. – 44 rem.

A person bought 536 eggs at 2 a penny, and another sort at 3 a penny, which together sold out for £2. 6s. 4d.; how many eggs were bought at 3 a penny? *Ans.* 864.

A steeple projected upon level ground a shadow to the distance of 144 yards, 2 feet, 2 inches, when my cane, 3 feet 2 inches in length, perpendicularly erected, cast a shadow of 6 feet 3 inches; the height of the steeple is required? *Ans.* 73 yards, 0 ft., 11$\frac{44}{75}$ in.

Suppose I see a flash of lightning, and count 5 seconds before I hear the thunder, how far is the thunder-cloud from me, sound travelling at the rate of 1142 feet in a second? *Ans.* 1 mile, 430 feet.

The Rule of Three Inverse.

Inverse Proportion is, when *more* requires *less*, and *less* requires *more*. More requires less is when the third term is greater than the first, and requires the fourth term to be less than the second. And less requires more is when the third term is less than the first, and requires the fourth term to be greater than the second.

RULE.—Multiply the first and second terms together, and divide the product by the third; the quotient will bear such proportion to the second, as the first does to the third.

EXAMPLES.

If 8 men do a piece of work in 12 days, in how many days can 16 men perform the same?

$$\text{men.} \quad \text{days.} \quad \text{men.}$$
$$8 \ : \ 12 \ :: \ 16 \ : \ 6 \text{ days.}$$
$$8$$
$$\overline{}$$

$$16) 96 (6 \text{ days. } Ans.$$
$$96$$
$$\overline{}$$

NOTE.—The distinction between Direct and Inverse Proportion, is thus exemplified:—

If 2 yards of cloth cost 4s., what cost 8 yards? Ans. 16s.

Here as 2 yards cost 4s., certainly 8 yards cannot be purchased without more money; hence it is more requires more, which is Direct Proportion. But,

If 2 men do a piece of work in 4 days, in what time can 8 men do it? Ans. I day. As the 8 men will complete the work in less time than 2, it is more requires less, which constitutes Inverse Proportion.

If 54 men can build a house in 90 days, how many men can do the same in 50 days? *Ans.* 97½ men.

If when a peck of wheat is sold for 2s. the penny loaf weighs 8 oz., how much must it weigh when the peck is worth but 1s. 6d. ? *Ans.* 10 oz. 10⅔ dr.

How many pieces of money of 20s. value, are equal to 240 pieces of 12s. each? *Ans.* 144.

How many yards of 3 quarters wide, are equal in measure to 30 yards of 5 quarters wide? *Ans.* 50.

If I lent my friend £200 for 12 months, how long ought he to lend me £150 to requite my kindness?
Ans. 16 months.

If for 24s. I have 1200 lbs. carried 36 miles, how many pounds can I have carried 24 miles for the same money? *Ans.* 1800 lbs.

If 108 workmen finish a piece of work in 12 days; how many are sufficient to finish it in 3 days? *Ans.* 432.

An army besieging a town, in which were 1000 soldiers, with provisions for 3 months, how many soldiers must depart that the provisions may last 5 months? *
Ans. 400.

If £20 worth of wine is sufficient to serve an ordinary of 100 men, when the tun is sold for £30; how many will £20 worth suffice, when the tun is sold but for £24?
Ans. 125 men.

A courier makes a journey in 24 days, when the day is but 12 hours long; how many days will he be going the same journey, when the days are 16 hours long? *Ans.* 18.

* The stating of this question determines that 600 soldiers can subsist for five months, on the same provisions that will serve 1000 for three months; their difference is the number that must depart.

It is by Inverse Proportion that the quantity of paper used in papering a room is ascertained, viz.—As the height of the room is to the extent round it, so is the width of the paper to the quantity required, in the same denomination the dimensions were taken. Divide the answer by how much a piece measures; and find the value by Direct Proportion, either at per yard or per piece.

How much plush is sufficient for a cloak, which has in it 4 yards of 7 quarters wide of stuff for the lining; the plush being but 3 quarters wide ?   *Ans.* 9⅓ yards.

If 14 pioneers make a trench in 18 days of 12 hours, how many days will 32 men take to do the same ?
                              Ans. 7 days, 10 hours, 30 min.

If a board be 5 inches broad, how many inches in length will make a square foot ?   *Ans.* 28⅘.

Suppose I have right of common for 200 sheep 80 days, how long may I turn on 800 sheep ? *Ans.* 20 days.

A regiment of soldiers, consisting of 1000 men, are to have new coats, each coat to contain 2½ yards of cloth, 5 quarters wide, and to be lined with shalloon of 3 quarters wide; I demand how many yards of shalloon will line them ?   *Ans.* 4166 yards, 2 qrs. 2 nails. – 2 rem.

Borrowed of my friend £64 for 8 months, and he hath occasion another time to borrow of me for 12 months; how much must I lend him to requite his former kindness to me ?   *Ans.* £42. 13s. 4d.

RULE OF THREE IN VERSE.

The Double Rule of Three.

Compound Proportion is composed of 5 numbers given to find a 6th, which, if the proportion is *Direct*, must bear such proportion to the 4th and 5th, as the third bears to the 1st and 2nd. But if *Inverse*, the 6th number must bear such proportion to the 4th and 5th, as the 1st bears to the 2nd and 3rd. The three first terms are a *supposition*; the two last a *demand*.

RULE.

1. Let the principal cause of loss or gain, interest or decrease, action or passion, be put in the first place.

2. Let that which betokeneth time, distance, or place, and the like, be in the second place, and the remaining one in the third.

3. Place the other two terms under their like in the supposition.

4. If the blank falls under the third term, multiply the first and second terms for a divisor, and the other three for a dividend. But,

5. If the blank fall under the first or second term, multiply the third and fourth terms for a divisor, and the other three for the dividend, and the quotient will be the answer.

EXAMPLES.

If 14 horses eat 56 bushels of oats in 16 days; how many bushels will be sufficient for 20 horses for 24 days ?

By two single rules. | *Or, in one stating, worked thus:*

hor. bu. hor. bu.

1. As 14 : 56 :: 20 : 80

days bu. hor. bu.

2. As 16 : 80 :: 24 : 120

hor. da. bu.

14 : 16 : 56

20 : 24 : −

$$\frac{56 \times 20 \times 24}{14 \times 16} = 120 \, Ans.$$

If 8 men in 14 days can mow 112 acres of grass; how many men must there be to mow 2000 acres in 10 days?

$$\begin{array}{llll} ac. & da. & ac. & da. \\ \end{array}$$

1. As 112 : 14 :: 2000 : 250 $\left.\begin{array}{llll} me. & da. & ac. \\ 8 & : & 14 & : & 112 \end{array}\right.$ $\dfrac{8 \times 14 \times 2000}{112 \times 10} = 200 \ Ans.$

2. As 250 : 8 :: 10 : 200 $\left.\begin{array}{llll} da. & men & da. & men \\ - & : & 10 & : & 2000 \end{array}\right.$

If £100 in 12 months gain £6 interest; how much will £75 gain in 9 months?   *Ans.* £3. 7s. 6d.

If a carrier receive £2. 2s. for the carriage of 3 cwt. 150 miles; how much ought he to receive for the carriage of 7 cwt. 3 qrs. 14 lb. for 50 miles?   *Ans.* £1. 16s. 9d.

If a regiment of soldiers, consisting of 136 men, consume 351 quarters of wheat in 108 days; how many quarters of wheat will 11,232 soldiers consume in 56 days?   *Ans.* 15,031.

If 40 acres of grass be mowed by 8 men in 7 days, how many acres can be mowed by 24 men in 28 days?
        Ans. 480.

If 40s. will pay 8 men for 5 days' work, how much will pay 32 men for 24 days' work?   *Ans.* £38. 8s.

If £100 in 12 months gain £6 interest, what principal will gain £3. 7s. 6d. in 9 months?   *Ans.* £75.

If a regiment, consisting of 939 soldiers, consume 351 quarters of wheat in 168 days; how many soldiers will consume 1404 qrs. in 56 days?   *Ans.* 11,268.

A family, consisting of 7 persons, drink 2 kilderkins of beer in 12 days; how many kilderkins will there be drank out by another family of 14 persons in 8 days?
        Ans. 2 kilds. and 12 gal.

If the carriage of 60 cwt. for 20 miles cost £14. 10s., what weight can I have carried 30 miles for £5. 8s. 9d. at the same rate?   *Ans.* 15 cwt.

If £100 in 12 months gain £7 interest; what is the interest of £571 for 6 years?   *Ans.* £239. 16s. 4¾d.

If I pay 10s. for the carriage of 2 tons for 6 miles; what must I pay for the carriage of 12 tons, 17 cwt., 17 miles?   *Ans.* £9. 2s. 0½d.

PRACTICE

PRACTICE is so called, from the general use there-of by all persons concerned in trade and business.

All questions in this Rule are performed by taking aliquot or even parts, by which means many tedious reductions are avoided.

TABLE OF ALIQUOT PARTS.

Of a Penny.		*Of a Pound.*		*Of a Pound.*	
¼d.	is $\frac{1}{4}$	1d. is	$\frac{1}{240}$	1s. is	$\frac{1}{20}$
½	,, $\frac{1}{2}$	1½ −	$\frac{1}{160}$	1s. 3d. −	$\frac{1}{16}$
Of a Shilling.		2 −	$\frac{1}{120}$	1s. 4d. −	$\frac{1}{15}$
¾d.	is $\frac{1}{16}$	3 −	$\frac{1}{80}$	1s. 8d. −	$\frac{1}{12}$
1½	− $\frac{1}{12}$	3½ −	$\frac{1}{64}$	2s. −	$\frac{1}{10}$
1	− $\frac{1}{8}$	4 −	$\frac{1}{60}$	2s. 6d. −	$\frac{1}{8}$
2	− $\frac{1}{6}$	5 −	$\frac{1}{48}$	3s. 4d. −	$\frac{1}{6}$
3	− $\frac{1}{4}$	6 −	$\frac{1}{40}$	4s. −	$\frac{1}{5}$
4	− $\frac{1}{3}$	7½ −	$\frac{1}{32}$	5s. −	$\frac{1}{4}$
6	− $\frac{1}{2}$	8 −	$\frac{1}{30}$	6s. 8d. −	$\frac{1}{3}$
		10 −	$\frac{1}{24}$	10s. −	$\frac{1}{2}$

Of a Ton.		*Of a Cwt.*		*Of a Quarter.*	
10 cwt.	is $\frac{1}{2}$	2 qrs. is	$\frac{1}{2}$	14 lb. is	$\frac{1}{2}$
5	− $\frac{1}{4}$	1 −	$\frac{1}{4}$	7 −	$\frac{1}{4}$
4	− $\frac{1}{5}$	16 lb. −	$\frac{1}{7}$	4 −	$\frac{1}{7}$
2½	− $\frac{1}{8}$	14 −	$\frac{1}{8}$	3½ −	$\frac{1}{8}$
2	− $\frac{1}{10}$	8 −	$\frac{1}{14}$	2 −	$\frac{1}{14}$
1	− $\frac{1}{20}$	7 −	$\frac{1}{16}$	1 −	$\frac{1}{28}$

RULE 1.—*When the price is less than a Penny:* divide the aliquot parts that are in a penny ; then by 12 and 20, which will be the answer.

¼d. is ¼) 5704 lb. at ¼d.   7695   at   ½d.
         —————   *Ans.* £16 . 0 . 7½
     12) 1426   5740   at   ½d.
         —————   *Ans.* £11 . 19 . 2
   2,0) 11,8 . 10   6547   at   ¾d.
         —————   *Ans.* £20 . 9 . 2½
  Ans. £5 . 18 . 10   4573   at   ¾d.
         —————   *Ans.* £14 . 5 . 9¾

RULE 2.—*When the price is less than a Shilling :*— take the aliquot part, or parts, that are in a shilling, add them together and divide by 20, as before.

1d. is ¹⁄₁₂) 7547   at   1d.   1d. is ¹⁄₁₂) 3751   at   1¼d.
         —————   ¼d. is ¼   312 . 7
    2,0) 62,8 . 11   78 . 1¾
         —————   —————
   Ans. £31 . 8 . 11   2,0) 39,0 . 8¾
         —————   —————

2351   at   2d.   *Ans.* £19 . 10 . 8¾
  Ans. £19 . 11 . 10

3250   at   2¾d.
    Ans. £37 . 4 . 9½   2759   at   8½d.
7062   at   3¼d.   *Ans.* £97 . 14 . 3½
    Ans. £95 . 12 . 7½   5272   at   9d.
2107   at   4¾d.   *Ans.* £197 . 14
   Ans. £41 . 14 . 0¼   2150   at   9¾d.
3120   at   5½d.   *Ans.* £87 . 6 . 10½
    Ans. £71 . 10   7291   at   10¾d.
7914   at   6¼d.   *Ans.* £326 . 11 . 6¼
   Ans. £206 . 1 . 10½   7972   at   11¾d.
3714   at   7¾d.   *Ans.* £390 . 5 . 11
   Ans. £119 . 18 . 7½

DAILY PRACTICE.

RULĒ 3.—*When the price is more than one Shilling, and less than two :* take the part or parts, with so much of the given price as is more than a shilling, which add to the given quantity, and divide by 20 for the answer.

¼ is ¹⁄₄₈ 2106 at 12¼d.
   43 . 10½

2,0) 214,9 . 10½

Ans. £107 . 9 . 10½

½ is ¹⁄₂₄ 3715 at 12½d.
   154 . 9½

2,0) 386,9 . 9½

£193 . 9 . 9½ *Ans.*

2712 at 12¾d.
 Ans. £144 . 1 . 6

2107 at 1s. 1d.
 Ans. £114 . 2 . 7

3215 at 1s. 1¼d.
 Ans. £177 . 9 . 10¾

2790 at 1s. 1½d.
 Ans. £156 . 18 . 9

7904 at 1s. 1¾d.
 Ans. £452 . 16 . 8

3750 at 1s. 2d.
 Ans. £218 . 15

3291 at 1s. 2¼d.
 Ans. £195 . 8 . 0¾

9254 at 1s. 2½d.
 Ans. £559 . 1 . 11

7250   at   1s. 2¾d.
    Ans. £445 . 11 . 5½

6325   at   1s. 3¼d.
    Ans. £401 . 18 . 0¼

5271   at   1s. 3½d.
    Ans. £340 . 8 . 4½

3254   at   1s. 3¾d.
    Ans. £213 . 10 . 10½

2915   at   1s. 4d.
    Ans. £194 . 6 . 8

7059   at   1s. 4½d.
    Ans. £485 . 6 . 1½

2750   at   1s. 4¾d.
    Ans. £191 . 18 . 6½

3725   at   1s. 5d.
    Ans. £263 . 17 . 1

7250   at   1s. 5¼d.
    Ans. £521 . 1 . 10½

2597   at   1s. 5½d.
    Ans. £189 . 7 . 3½

7210   at   1s. 5¾d.
    Ans. £533 . 4 . 9½

7524   at   1s. 6d.
    Ans. £564 . 6

3254   at   1s. 6½d.
    Ans. £250 . 16 . 7

7925   at   1s. 6¾d.
    Ans. £619 . 2 . 9¾

9271   at   1s. 7d.
    Ans. £733 . 19 . 1

7210   at   1s. 7¼d.
    Ans. £578 . 6 . 0½

2310   at   1s. 7½d.
    Ans. £187 . 13 . 9

2504   at   1s. 7¾d.
    Ans. £206 . 1 . 2

7152   at   1s. 8d.
    Ans. £596.

2905   at   1s. 8¼d.
    Ans. £245 . 2 . 2¼

7104   at   1s. 8½d.
    Ans. £606 . 16

1004   at   1s. 8¾d.
    Ans. £86 . 16 . 1

2104   at   1s. 9d.
    Ans. £184 . 2

2571   at   1s. 9¼d.
    Ans. £227 . 12 . 9¾

2104   at   1s. 9½d.
    Ans. £188 . 9 . 8

7506   at   1s. 9¾d.
    Ans. £680 . 4 . 7½

1071   at   1s. 10d.
    Ans. £98 . 3 . 6

5200   at   1s. 10¼d.
    Ans. £482 . 1 . 8

2117   at   1s. 10½d.
    Ans. £198 . 9 . 4½

5000   at   1s. 11d.
    Ans. £479 . 3 . 4

2105   at   1s. 11¼d.
    Ans. £203 . 18 . 5¼

1006   at   1s. 11½d.
    Ans. £98 . 10 . 1

2705   at   1s. 11¾d.
    Ans. £267 . 13 . 7¾

4000   at   1s. 11¾d.
    Ans. £395 . 16 . 8

ROUGH PRACTICE.

RULE 4.—*When the price consists of an even number of Shillings under* 20: multiply the given quantity by half the price, doubling the first figure of the product for shillings, and the rest of the product will be pounds.

2750 at 2s.	1572 at 8s.	
Ans. £275.	*Ans.* £628. 16	
3254 at 4s.	5271 at 14s.	
Ans. £650. 16	*Ans.* £3689. 14	
2710 at 6s.	1621 at 18s.	
Ans. £813.	*Ans.* £1458. 18	

NOTE.—When the price is 10s. take half of the quantity, and if any remains, it is 10s.

RULE 5.—*When the price consists of odd Shillings :* multiply the given quantity by the price, and divide by 20 ; the product will be the answer.

3270 at 3s. 3 ——— 2,0)981,0 ——— £490 . 10. *Ans.* ———	3214 at 9s. *Ans.* £1446. 6 2710 at 11s. *Ans.* £1490. 10 3179 at 13s. *Ans.* £2066. 7
2703 at 1s. *Ans.* £135. 3	2150 at 15s. *Ans.* £1612. 10
4570 at 3s. *Ans.* £685. 10	3142 at 17s. *Ans.* £2670. 14
3271 at 5s. *Ans.* £817. 15	2150 at 19s. *Ans.* £2042. 10
2715 at 7s. *Ans.* £950. 5	7157 at 19s. *Ans.* £6799. 3

NOTE.—When the price is 5s. divide the quantity by 4, and the remainder (if any) multiplied by 5 will be shillings.

RULE 6.—*When the price is Shillings and Pence, and an aliquot part of a pound :* divide by the aliquot part, and it will give the answer at once ; but if they are *not an aliquot part,* then multiply the quantity by the shillings, and take parts for the rest, add them together, and divide by 20.

2d. is $\frac{1}{6}$ 2710 at 3s. 2d. 3 ——— 8130 451 . 8 ——— 2,0)858,1 . 8 ——— *Ans.* £429 . 1 . 8	6s. 8d. is $\frac{1}{3}$ 2710 at 6s. 8d. ——— *Ans.* £903 . 6 . 8 ——— 3150 at 3s. 4d. *Ans.* £525. 2715 at 2s. 6d. *Ans.* £339. 7. 6
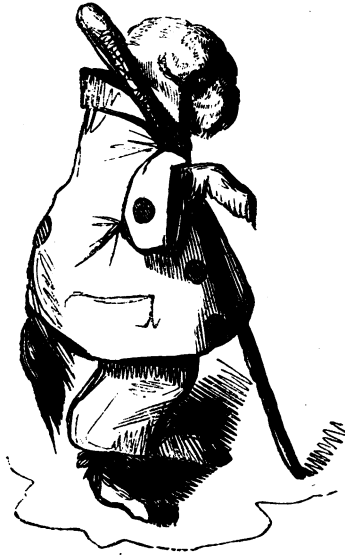
HARD PRACTICE.

7150 at 1s. 8d.	2103 at 15s. 4½d.
Ans. £595. 16. 8	*Ans.* £1616. 13. 7½
3215 at 1s. 4d.	7152 at 17s. 6¾d.
Ans. £214. 6. 8	*Ans.* £6280. 7
7211 at 1s. 3d.	2510 at 14s. 7¼d.
Ans. £450. 13. 9	*Ans.* £1832. 16. 5½
7514 at 4s. 7d.	3715 at 9s. 4½d.
Ans. £1721. 19. 2	*Ans.* £1741. 8. 1½
2517 at 5s. 3d.	2572 at 13s. 7½d.
Ans. £660. 14. 3	*Ans.* £1752. 3. 6
2547 at 7s. 3½d.	7251 at 14s. 8¼d.
Ans. £928. 11. 10½	*Ans.* 5324. 19. 0¾
3271 at 5s. 9½d.	3210 at 15s. 7¾d.
Ans. £947. 4. 6½	*Ans.* £2511. 3. 1½

RULE 7.—*When the price is Pounds and Shillings:* multiply the quantity by the pounds, and proceed with the shillings, if they are even, as in the 4th Rule; if odd, take the aliquot parts, add them together, the sum will be the answer.

When the given quantity is no more than three figures, proceed as in Compound Multiplication.

4s. is ⅕   7215 at £7. 4s.
             7 £
             ──────
            50505
             1443
             ──────
          £51948 *Ans.*
             ──────

2s. is 1/10   2104 at £5. 3s.
              5 £
              ──────
            10520
1s. is ½   210 . 8
              105 . 4
              ──────
          £10835 . 12 *Ans.*
              ──────

    2107   at   £2. 8s.
       Ans. £5056. 16
    3215   at   £1. 17s.
       Ans. 5947. 15
    2107   at   £1. 13s.
       Ans. £3476. 11

6d. is ½   2710 at £2 . 3 . 7½
             43s.
             ──────
            116530
1½d is ¼   1355
             338 . 9
           ──────────
2,0) 11822,3 . 9
     ──────────
    £ 5911 . 3 . 9

    3215   at   £4. 6s. 8d.
       Ans. £13931. 13. 4
    2154   at   £7. 1s. 3d.
       Ans. £15212. 12. 6
    2701   at   £2. 3s. 4d.
       Ans. £5852. 3. 4
    2715 at £1. 17s. 2½d.
       Ans. £5051. 0. 7½
    2157 at £3. 15s. 2¼d.
       Ans. £8108. 19. 5¼
    2157 at £2. 7s. 4½d.
       Ans. 5109. 7. 10½

NOTE 1.—When pounds, shillings, and pence, and the shillings and pence the aliquot parts of a pound, multiply the quantity by the pounds, and take parts for the rest.

2. When the price is pounds, shillings, pence, and farthings, and the shillings and pence not the aliquot parts of a pound, reduce the pounds and shillings into shillings, multiply the quantity by the shil_ lings, take parts for the rest, add them together, and divide by 20.

RULE 8.—*When the price and quantity given are of several denominations:* multiply the price by the integers, and take parts of the price for the lower denominations.

At £3. 17s. 6d. per cwt. ; what is the value of 25 cwt. 2 qrs. 14 lb. of tobacco ?

$$2 \text{ qrs. is } \tfrac{1}{2} \quad \text{£3 . 17s . 6d.} \qquad 5 \times 5 = 25$$

$$5$$

$$\overline{\qquad\qquad}$$

$$19 . 7 . 6$$

$$5$$

$$\overline{\qquad\qquad}$$

$$96 . 17 . 6 = 25 \text{ cwt.}$$
$$14 \text{ lb. is } \tfrac{1}{4} \quad 1 . 18 . 9 = 2 \text{ qrs.}$$
$$0 . 9 . 8\tfrac{1}{4} = 14 \text{ lbs.}$$

$$\overline{\qquad\qquad}$$

$$\text{£99 . 5 . 11}\tfrac{1}{4} \textit{ Ans.}$$

At £3. 14s. 8d. per cwt. ; what cost 17 cwt. 1 qr. 11 lb. of cheese ? *Ans.* £64. 15s. 4d.

Sold 85 cwt. 1 qr. 10 lb. of butter at £4. 6s. 4d. per cwt. ; how much does it come to ? *Ans.* £368. 7s. 7½d.

Hops at £4. 5s. 8d. per cwt. ; what must be given for 72 cwt. 1 qr. 18 lb. ? *Ans.* £310. 3s. 2d.

What is the value of 27 cwt. 2 qr. 15 lb. of Malaga raisins, at £2. 6s. 8d. per cwt. ? *Ans.* £64. 9s. 7d.

Sold 56 cwt. 1 qr. 17 lb. of sugar, at £2. 15s. 9d. the cwt. ; what does it come to ? *Ans.* £157. 4s. 4½d.

Tobacco at £3. 17s. 10d. the cwt. ; what is the value of 97 cwt. 15 lb. ? *Ans.* £378. 0s. 3d.

Bought sugar at £3. 14s. 6d. per cwt. ; what did I give for 15 cwt. 1 qr. 10 lb. ? *Ans.* £57. 2s. 9d.

Soap at £3. 11s. 6d. the cwt. ; what is the value of 53 cwt. 17 lb. ? *Ans.* £190. 0s. 4d.

How much is the import duty on 45 tons, 17 cwt. 2 qrs. of foreign iron, at £7. 18s. 4d. per ton ? *Ans.* £363. 3s. 6½d.

Tare and Tret.

By these Rules, merchants and wholesale dealers deduct certain allowances made by them in selling their goods by weight.

GROSS WEIGHT is the whole weight of any sort of goods, and that of the package which contains them.

TARE is an allowance made to the buyer for the weight of the box, barrel, bag, &c., which contains the goods bought, and is either

At so much per box, barrel, &c.

At so much per cwt. or per 100 lb.

At so much in the gross weight.

GROSS WEIGHT.

P. Cruik. sc

NET WEIGHT,

NET, or NEAT WEIGHT is what remains after all the allowances have been deducted.

OR NEAT WEIGHT.

TRET is an allowance of 4 lb. in every 104 lb., or $\frac{1}{26}$th for waste, dust, &c., made by the merchant to the buyer.

CLOFF is an allowance of 2 lb. for every 3 cwt., or $\frac{1}{168}$th part for waste on a few articles, but is now very seldom made.

SUTTLE is when only part of the allowances have been deducted from the gross.

NOTE.—*Draft* is an allowance in consequence of weighing goods on the quays in very large quantities, so that the weight may not prove deficient when sold again in smaller quantities, for retail sale; it is deducted in the first instance, as the goods are weighed, and the remainder entered as gross weight.

The deduction sanctioned by Government for Draft, is 1 lb. on goods not exceeding 1 cwt.; 2 lb. from 1 to 2 cwt.; 3 lb. from 2 to 3 cwt.; 4 lb. from 3 to 10 cwt.; 7 lb. from 10 to 18 cwt.; and 9 lb. from 18 to 90 cwt. and upwards; but among private individuals, on goods not subject to such control, the parties concerned mutually determine the allowance.

Tret and Cloff are in a manner synonymous, each being for waste or dust, and as some articles are subject to a greater portion of it than others, Tret has not been deemed sufficient, and the additional allowance of Cloff prevails on goods of particular descriptions; it is not unusual to enter it waste, dust, or rubbish, &c.— Whenever two or more of the deductions are similar, that is, so much per cwt. or per hhd. &c., they should be calculated conjointly, as contributing to expedition.

Conformable to a recent regulation at the Custom House in London, all the deductions are discontinued but Tare, and on very particular occasions dust or rubbish; but they remain in practice among merchants to a certain extent.

It may here be observed, that in computing the allowances for Tare, Tret, &c., we may reject any fraction less than $\frac{1}{4}$ of a lb. and yet obtain an answer sufficiently exact for practical purposes. In business, the uniform practice is to reject any fraction less than $\frac{1}{2}$ lb. and to allow 1 lb. when the fraction is equal to $\frac{1}{2}$ lb. or upwards.

RULE 1.—*When the Tare is at so much per bag, barrel, &c.:* multiply the number of bags, barrels, &c. by the tare, and subtract the product from the gross; the remainder is the net.

In 7 frails of raisins, each weighing 5 cwt. 2 qrs. 5 lb. gross, tare at 23 lb. per frail, how much net weight ?
Ans. 37 cwt. 1 qr. 14 lb.

	cwt. qr. lb.			cwt. qr. lb.
23 lb.	5 . 2 . 5		or,	5 . 2 . 5
7 frails.	7		per frail	23 lb.

28)161 (5 qrs.	38 . 3 . 7 = gross.	net 5 . 1 . 10
140 1 *cwt.* 1 *qr.*	1 . 1 . 21 = tare.	frails 7

| 21 *lbs.* Cwt. 37 . 1 . 14 net. | Cwt. 37 . 1 . 14 |

What is the net weight of 25 hogsheads of tobacco, weighing gross 163 cwt. 2 qrs. 15 lb., tare 100 lb. per hogshead ?   *Ans.* 141 cwt. 1 qr. 7 lb.

In 16 bags of pepper, each 85 lb. 4 oz. gross, tare per bag 3 lb. 5 oz.; how many pounds net?   *Ans.* 1311.

RULE 2.—*When the Tare is at so much in the whole gross weight:* subtract the given tare from the gross, the remainder is the net.

What is the net weight of 5 hogsheads of tobacco, weighing gross 75 cwt. 1 qr. 14 lb., tare in the whole 752 lb.?   *Ans.* 68 cwt. 2 qrs. 18 lb.

In 75 barrels of figs, each 2 qrs. 27 lb. gross, total tare 597 lb.; how much net weight?   *Ans.* 50 cwt. 1 qr.

RULE 3.—*When the Tare is at so much per cwt.:* divide the weight by the aliquot parts of a cwt., which subtract from the gross; the remainder is the net.

In 25 barrels of figs, each 2 cwt. 1 qr. gross, tare 16 lb. per cwt., how much net weight? *Ans.* 48 cwt. 24 lb.

What is the net weight of 18 butts of currants, each
8 cwt. 2 qrs. 5 lb., tare at 14 lb. per cwt.?

$$
\begin{array}{r}
\textit{cwt.} \quad \textit{qr.} \quad \textit{lb.} \\
8 \ . \ 2 \ . \ \ 5 \\
9 \times 2 = 18 \\
\hline
76 \ . \ 3 \ . \ 17 \\
2 \\
\hline
14 \text{ lb.} = \tfrac{1}{8}) \ 153 \ . \ 3 \ . \ \ 6 \\
19 \ . \ 0 \ . \ 25\tfrac{1}{4} \\
\end{array}
$$

Ans.   Cwt. 134 . 2 . 8¾ net weight.

What is the net weight of 9 hogsheads of nutmegs,
each weighing gross 8 cwt. 3 qrs. 14 lb., tare 16 lb. per
cwt.?   *Ans.* 68 cwt. 1 qr. 24 lb.

RULE 4.—*When Tret is allowed with Tare :* divide
the lbs. suttle by 26, the quotient is the tret, which sub-
tract from the suttle; the remainder is the net.

In a cask of currants weighing 12 cwt. 2 qrs. 24 lb.
gross, tare 14 lb. per cwt., tret 4 lb. per 104 lb.; how
many lbs. net?

$$
\begin{array}{r}
\textit{cwt.} \quad \textit{qr.} \quad \textit{lb.} \\
12 \ . \ 2 \ . \ 24 \\
4 \\
\hline
50 \\
28 \\
\hline
14 \text{ lb.} = \tfrac{1}{8}) \ 1424 \text{ gross.} \\
178 \text{ tare.} \\
\hline
\tfrac{1}{26}) \ 1246 \text{ suttle.} \\
47 \text{ tret.} \\
\end{array}
$$

Short way of reducing cwts.
into lbs. by *Addition.*

$$
\begin{array}{r}
12 \ . \ 2 \ . \ 24 \\
12 \\
12 \\
\hline
12,80 = 2 \text{ qr. 14 lbs.} \\
\hline
1424 \text{ lbs.}
\end{array}
$$

Ans. 1199 lb. net.

In 7 cwt. 3 qrs. 27 lb. gross, tare 36 lb., tret 4 lb. per 104 lb. ; how many lbs. net ?   *Ans.* 826 lbs.

152 cwt. 1 qr. 3 lb. gross, tare 10 lb. per cwt., tret 4 lb. per 104 lb.; how much net weight ?
    Ans. 133 cwt. 1 qr. 11 lb.

RULE 5.—*When Cloff is allowed :* multiply the cwts. suttle by 2, divide the product by 3, the quotient will be the pounds cloff, which subtract from the suttle; the remainder gives the net.

What is the net weight of 3 hogsheads of tobacco weighing 15 cwt. 3 qrs. 20 lb. gross, tare 7 lb. per cwt., tret 4 lb. per 104 lb., cloff 2 lb. for 3 cwt. ?
    Ans. 14 cwt. 1 qr. 3 lb.

$$
\begin{array}{lllll}
 & cwt. & qr. & lb. & \\
7\ lb. = \tfrac{1}{16}\,) & 15 & .\ 3 & .\ 20 & \text{gross.} \\
 & & 3 & .\ 27\tfrac{1}{2} & \text{tare.} \\
\hline
\tfrac{1}{26}\,) & 14 & .\ 3 & .\ 20\tfrac{1}{2} & \text{suttle.} \\
 & & 2 & .\ 8 & \text{tret.} \\
\hline
\tfrac{1}{168})\ & 14 & .\ 1 & .\ 12\tfrac{1}{2} & \text{suttle.} \\
 & & & 9\tfrac{1}{2} & \text{cloff.} \\
\hline
\textit{Ans.}\ \ 14 & .\ 1 & . & 3 & \text{net weight.} \\
\hline
\end{array}
$$

In 7 hogsheads of Virginia tobacco, weighing each 5 cwt. 2 qr. 7 lb., tare 8 lb. per cwt., and the usual tret and cloff, how many pounds net?   *Ans.* 3780 lbs.

Find the net weight and price of 9 casks madder, weighing 85 cwt. 3 qr. 22 lb., draft 4 lb. per cask, and tare 10 lb. per cwt., at 4 guineas per cwt.?
    Ans. 77 cwt. 3 qr. 26 lb. net; price £327. 10s. 6d.

NOTE.—Cloff is ascertained by the above rule, when the allowance is 2 lb. per 3 cwt. ; but when different, another divisor must be substituted in proportion to the given rates.

Commission,

Is an allowance of so much per cent. to a factor or agent, employed in buying or selling goods, or transacting business in general for their employers.

RULE.—Multiply the sum by the rate per cent., and divide by 100. If a fraction is annexed to the rate, take a proportional part for it. Or, which is often shorter, *take aliquot parts of* 100 *for the rate* :

per cent.		per cent.	
For $1\frac{1}{4}$ take $\frac{1}{80}$ of the sum.		For $3\frac{1}{3}$ take $\frac{1}{30}$ of the sum.	
2 take $\frac{1}{50}$ of the sum.		4 take $\frac{1}{25}$ of the sum.	
$2\frac{1}{2}$ take $\frac{1}{40}$ of the sum.		5 take $\frac{1}{20}$ of the sum.	

Find the commission on £987. 15s., at $1\frac{1}{4}$ per cent.
Ans. £12. 6s. $11\frac{1}{4}$d.
Find the commission on £876. 5s., at $1\frac{1}{2}$ per cent.
Ans. £13. 2s. $10\frac{1}{2}$d.
Find the commission on £765. 10s. 5d., at 2 per cent.
Ans. £15. 6s. $2\frac{1}{2}$d.

What is the commission on £287. 10s., at 3½ per cent.?

½...£287 . 10s.

3½ rate
_____

862 . 10
143 . 15
_____

£10,06 . 5
20
_____
1,25
12
_____
3,

Or by aliquot parts.

$\frac{1}{100}, \frac{1}{40}$) 287 . 10 . 0
_____

7 . 3 . 9 = 2½ per ct.
2 . 17 . 6 = 1 per ct.
_____

Proof £10 . 1 . 3
_____

Ans. £10. 1s. 3d.
_____

Find the commission on £654. 12s. 6d., at 2¼ per cent.
                              Ans. £14. 14s. 7d.
Find the commission on £1276. 15s., at 2½ per cent.
                              Ans. £31. 18s. 4½d.
Find the commission on £1025. 17s. 6d., at 3⅓ per cent.
                              Ans. £34. 3s. 11d.
Find the commission on £903. 6s. 8d., at 3½ per cent.
                              Ans. 31. 12s. 4d.
Find the commission on £1368. 18s. 4d., at 3¾ per cent.
                              Ans. £51. 6s. 8¼d.

_____

𝔅rokerage

Is an allowance to a broker, or person employed to settle the prices and terms of purchases and sales of goods, negotiate bills, or effect insurances, &c.

RULE.—Divide the sum by 100; the quotient is to £1 per cent., of which take aliquot parts for the given rate.

M

What is the brokerage on £2575. 17s. 6d., at 5s. or ¼ per cent. ?

```
    25,75 . 17 . 6
       20                  5s....¼ ) 25 . 15 . 2 = 1 per cent.
    ─────
    15,17                      Ans. £6 .   8 . 9½
       12                      ──────────────►
    ─────
     2,10
    ─────
```

What is the brokerage on £9125, at ⅛ per cent. ?
                                   Ans. £11. 8s. 1½d.
What is the brokerage on £7283. 6s. 8d., at 1¼ per cent.?   *Ans.* £18. 4s. 2d.
What is the brokerage on £1826. 15s., at ⅓ per cent. ?
                                   Ans. £6. 1s. 9¼d.
What is the brokerage on £3650. 18s. 4d., at ½ per cent. ?   *Ans.* £18. 5s. 1d.
What is the brokerage on £2195. 10s., at ¾ per cent.?
                                   Ans. £16. 9s. 4d.
What is the brokerage on £1987. 5s., at ⅞ per cent.?
                                   Ans. £17. 7s. 9d.

A broker procures sales for his employer to the amount of £2752. 10s.; how much does his allowance come to at ½ per cent. ?   *Ans.* £13. 15s. 3d.

A broker negotiates bills for A B to the amount of £36,622. 10s. at 6s. 8d. per 100; how much does his allowance come to?   *Ans.* £122. 1s. 6d.

An agent sold goods for his principal to the amount of £2520. 16s. 8d.; how much will his commission come to at 2 per cent. ?   *Ans.* £50. 8s. 4d.

An agent purchases for his employer goods to the value of £937. 10s.; how much is his commission at 3¼ per cent. ?   *Ans.* £30. 9s. 4½d.

Sent my employer in Jamaica an account sales of sugar, which sold for £2750. 18s. 9d.; commission 2½ per cent.; brokerage ½ per cent.; duty and charges £935. 7s. 6d.: how much will the net proceeds of the sales come to?   *Ans.* £1733. 0s. 8½d.

STOCKS.

TOCKS, or Public Funds, are debts of Government created by loans, and for which a fixed interest is paid from revenues set apart for the purpose : the funds are what constitute the national debt, & they fluctuate in price according to the abundance of money and prosperity of the country at large. The common or consolidated stock called Consols, now bears 3 per cent. interest per annum, and the price at present is 95 per cent., which is very high: at one period of the French war they were at 47 only.

Stock is also a general name for the capital of our

large trading corporations.   Foreign *Bonds* constitute securities, bearing interest, for moneys advanced on loan to various States; and *Shares* represent sums subscribed to the funds of joint-stock and public companies. These are received in the first instance at a fixed value, are transferable, and vary in price according to the success or failure of the undertaking: for example, the shares in the London and Birmingham Railway, issued at £100, have sold at £210, or at 110 per cent. *premium;* whenever they come again to £100, they will be *at par;* and if by want of success the public become dissatisfied with them, they would fall *below par,* or to a *discount :* as, at £95, they would be said to be at a discount of 5 per cent.

RULE.—1. *To find the value of a given quantity of stock :* multiply the quantity by the rate or price, and divide by 100.

2. *To find the quantity of stock which can be purchased for a given sum :* multiply the value by 100, and divide by the rate or price.

What is the cost of £800 stock, three per cent. Consols, at 72⅝ per cent. ; brokerage ⅛?   *Ans.* £582.

Find the cost of £1250 four per cents., at 79¼; brokerage ⅛ per cent.   *Ans.* £992. 3s. 9d.

What quantity of three per cent. Consols will £582. purchase at 72⅝; brokerage ⅛ per cent.?   *Ans.* £800.

What cost £185 stock in the Navy five per cents., purchased at 95¾; brokerage ⅛ per ct.? *Ans.* £176. 13s. 6d.

What is the value of £1250 Bank stock at 175½ per cent. ?   *Ans.* £2193. 15s.

How much India stock can be purchased for £2583, at 215¼ per cent. ?   *Ans.* £1200 stock.

What rate of interest has a person for his money in the South Sea stock at 71¾ per cent. ; the yearly dividends being 3½ per cent. ?   *Ans.* 4⅞ per cent.

NOTE.—Brokers are usually employed in transfers of stock, who charge ⅛ per cent., or 2s. 6d. on every £100 of stock bought or sold.

Simple Interest

Is the PROFIT allowed in lending or forbearance of any sum of money for a determined space of time.

The PRINCIPAL is the money lent, for which interest is to be received.

The RATE PER CENT. is a certain sum agreed on between the borrower and the lender, to be paid for every £100, for the use of the principal 12 months.

The AMOUNT is the principal and interest added together.

To find the Interest of any Sum of Money for a Year.

RULE.—Multiply the principal by the rate per cent; that product divided by 100, will give the interest required.

For several Years.

RULE.—Multiply the interest of one year by the number of years, and the product will be the answer.   Or,

Multiply the principal by the rate per cent. and the years, and divide by 100.

EXAMPLE.

What is the interest of £375 for a year, at 5 per cent. per annum?   5
                                                    ——
                                                  18,75
                                                     20
                                                    ——
                                                  15,00   *Ans.* £18. 15s.

What is the interest of £268 for one year, at 4 per cent. per annum ?   .   *Ans.* £10. 14s. 4¾d.—20 rem.

What is the interest of £945. 10s., for one year, at 4 per cent. per annum ?   *Ans.* £37. 16s. 4¾d.—20 rem.

NOTE.—When the rate per cent. is an aliquot part of 100, dividing the principal as in Practice by such aliquot part, will produce the interest for one year.

What is the interest of £547. 15s., at 3 per cent. per annum, for three years?　*Ans.* £49. 5s. 11¼d. – 60 rem.

What is the interest of £254. 17s. 6d., for five years, at 4 per cent. per annum?　　　*Ans.* £50. 19s. 6d.

What is the interest of £556. 13s. 4d., at 5 per cent. per annum, for five years?　　　*Ans.* £139. 3s. 4d.

When the Interest is for any number of Weeks.

RULE.—As 52 weeks are to the interest of the given sum for a year, so are the weeks given to the interest required.

$$£379. 13. 2 \times 4 \div 100 = £15. 3. 8\frac{1}{2}. - 88.$$

As 52 weeks : £15. 3s. 8½d. :: 4 weeks : £1. 3s. 4¼d. – 20 rem. *Ans.*

What is the interest of £259. 13s. 5d. for 20 weeks, at 5 per cent. per annum?　　*Ans.* £4. 19s. 10¼d. – 44 rem.

What is the amount of £375. 6s. 1d. for 12 weeks, at 4½ per cent. per annum?　　　*Ans.* £379. 4s. 0¼d.

What is the amount of £256. 5s. 3d. for 25 weeks, at 2¾ per cent. per annum?　　　*Ans.* £259. 13s.

When the Interest is for any number of Days.

As 365 days are to the interest of the given sum for a year, so are the days given to the interest required.

What is the interest of £240 for 120 days, at 4 per cent. per annum?

$$£240 \times 4 \div 100 = £9. 12s.$$

As 365 days : £9. 12s. :: 120 : £3. 3s. 1¼d. – rem. *Ans.*

What is the interest of £379. 5s. 4d. for 3 years and 75 days, at 5 per cent. per annum?　*Ans.* £60. 15s. 8d.

At 5½ per cent. per annum, what is the interest of £985. 2s. 7d. for 5 years, 127 days?　*Ans.* £289. 15s. 2d.

What is the interest of £2726. 1s. 4d. at 4½ per cent. per annum, for 3 years, 154 days?　*Ans.* £419. 15s. 6¼d.

Duodecimals,

OR CROSS MULTIPLICATION.

RULE.—1. Under the multiplicand write the corresponding denominations of the multiplier.

2. Multiply each term in the multiplicand (beginning at the lowest) by the feet in the multiplier; write each result under its respective term, observing to carry an unit for every 12, from each lower denomination to its next superior.

3. In the same manner multiply the multiplicand by the primes in the multiplier, and write the result of each term one place more to the right hand of those in the multiplicand.

4. Work in the same manner with the seconds in the multiplier, setting the result of each term two places to the right hand of those in the multiplicand, and so on for thirds, fourths, &c.

EXAMPLES.

1. Multiply 7 feet 9 inches by 3 feet 6 inches.

Cross Mult.	*Practice.*	*Duodecimals.*
7×9	6 in. $= \frac{1}{2}$ 7 . 9	7 . 9
$3 \quad 6$	3 . 6	3 . 6

Cross Mult.

21 . 0 . 0 $= 7 \times 3$
 2 . 3 . 0 $= 9 \times 3$
 3 . 6 . 0 $= 7 \times 6$
 0 . 4 . 6 $= 9 \times 6$
_____
27 . 1 . 6

Practice.

23 . 3
 3 . 10 . 6
_____
27 . 1 . 6

Duodecimals.

23 . 3 $\times 3$
 3 . 10 . 6 $\times 6$
_____
27 . 1 . 6

Multiply   8 ft. 5 in.   by   4 ft. 7 in.   *Ans.* 38 . 6 . 11
Multiply   9 . 8   by   7 . 6   *Ans.* 72 . 6

	f. in.		f. in.	ft. in. pts.
Multiply	8.1	by	3.5	Ans. 27.7.5
Multiply	7.6	by	5.9	Ans. 43.1.6
Multiply	4.7	by	3.10	Ans. 17.6.10
Multiply	7.5.9″	by	3.5.3″	Ans. 25.8.6.2‴3⁗
Multiply	10.4.5	by	7.8.6	Ans. 79.11.0.6‴6⁗.
Multiply	75.7	by	9.8	Ans. 730.7.8
Multiply	97.8	by	8.9	Ans. 854.7
Multiply	75.9	by	17.7	Ans. 1331.11.3
Multiply	87.5	by	35.8	Ans. 3117.10.4
Multiply	179.3	by	38.10	Ans. 6960.10.6
Multiply	259.2	by	48.11	Ans. 12677.6.10
Multiply	257.9	by	39.11	Ans. 10288.6.3
Multiply	321.7.3	by	9.3.6	Ans. 2988.2.10.4.6

ONE FOR SUMMING UP AND SETTLING A MAN'S ACCOUNT.